Appendix A

Health Information on Waste Minimization Priority Chemicals

1,2,4,5-Tetrachlorobenzene

CAS Number: 95-94-3

What is 1,2,4,5-tetrachlorobenzene?

1,2,4,5-Tetrachlorobenzene is an odorless man-made substance that can range in appearance from a colorless crystal to a white flaky or chunky solid.

What is 1,2,4,5-tetrachlorobenzene used for?

1,2,4,5-Tetrachlorobenzene is used as an intermediate or building block to make herbicides, insecticides and defoliants. It is also used to make other chemicals like 2,4,5-trichlorophenol and 2,4,5-trichlorophenoxyacetic acid.

How can 1,2,4,5-tetrachlorobenzene enter and leave your body?

1,2,4,5-Tetrachlorobenzene can enter your lungs if you breathe contaminated air. It can enter your body if you eat contaminated food or be absorbed through your skin if you come into contact with the substance.

How can you be exposed to 1,2,4,5-tetrachlorobenzene?

If you work in a factory that makes or uses 1,2,4,5-tetrachlorobenzene, you can be exposed by breathing contaminated air. You could also be exposed if you eat contaminated food like fish or if your skin comes into contact with the substance.

What are the health effects of exposure to 1,2,4,5-tetrachlorobenzene?

Exposure to 1,2,4,5-tetrachlorobenzene can irritate or bother your eyes and skin and can affect your ability to breathe. It can also affect the mucous membranes. In addition, laboratory animals exposed to 1,2,4,5-tetrachlorobenzene experienced lesions, or changes to the liver and kidney.

What levels of exposure have resulted in harmful health effects?

The U.S. Environmental Protection Agency established an oral reference dose (RfD) of 0.34 milligrams per kilogram per day for oral exposure to 1,2,4,5-tetrachlorobenzene. The RfD is an estimate of the highest daily oral exposure humans can be exposed to without resulting in harmful effects.

Where can you get more information?

Contact your state health or environmental department, or:

Agency for Toxic Substances and Disease Registry
Division of Toxicology
1600 Clifton Road, N.E., E-29
Atlanta, Georgia 30333

References

1. International Labor Organization. International Occupational Safety and Health Information Centre (CIS). *1,2,4,5-Tetrachlorobenzene ICSC*, 1994.
2. National Toxicity Program (NTP). *NTP Chemical Repository 1,2,4,5-Tetrachlorobenzene* (Radian Corporation, August 29, 199(1)
3. U.S. Environmental Protection Agency. *Integrated Risk Information System (IRIS) on 1,2,4,5-Tetrachlorobenzene.* Environmental Criteria and Assessment Office, Office of Health and Environmental Assessment, Cincinnati, OH.
4. U.S. Department of Health and Human Services. Hazardous Substances Data Bank

(HSDB, online database). National Library of Medicine Bethesda, MD, 2001.

1,2,4-Trichlorobenzene

CAS Number: 120-82-1

What is 1,2,4-trichlorobenzene?

1,2,4 -Trichlorobenzene is a man-made chemical that looks like a colorless liquid.

What is 1,2,4-trichlorobenzene used for?

1,2,4-Trichlorobenzene has several uses. It is used as an intermediate or building block to make herbicides, substances that destroy or prevent the growth of weeds. It is also used as a solvent and dielectric fluid (a liquid that conducts little or no electricity), a degreaser (a substance that removes grease), and as a lubricant.

How can 1,2,4-trichlorobenzene enter and leave your body?

1,2,4-Trichlorobenzene can enter your body when you breathe contaminated air or eat contaminated food. It can also be absorbed through your skin if you touch it.

How can you be exposed to 1,2,4-trichlorobenzene?

You can be exposed to 1,2,4-trichlorobenzene if you breathe contaminated air, eat contaminated food (especially fish), or if your skin comes into contact with the substance. If you work in an industry that makes or uses 1,2,4-trichlorobenzene, you can be exposed by breathing it while it is being made or used.

What are the health effects of exposure to 1,2,4-trichlorobenzene?

No information is available on the short- or long-term health effects of 1,2,4-trichlorobenzene in humans. However, animal studies show that rats exposed to the substance by injection experienced an enlargement of the adrenal glands located near the kidney. Rats that breathed the substance experienced irritation of the lungs and dyspnea, which is shortness of breath or difficulty breathing.

Rats exposed to 1,2,4-trichlorobenzene for a long period of time experienced a number of symptoms, including changes in the enzymes of the liver. Oral exposure resulted in an increase in the adrenal (glands near the kidney) weights.

No information is available to determine if 1,2,4-trichlorobenzene can cause cancer in humans. However, animal studies show that mice exposed to the substance through their skin developed tumors. The U.S. Environmental Protection Agency (EPA) has categorized 1,2,4-trichlorobenzene as “not classifiable” with respect to its likelihood to cause cancer.

What levels of exposure have resulted in harmful health effects?

The U.S. EPA established a reference dose (RfD) of 0.01 milligrams per kilograms a day of 1,2,4-trichlorobenzene. The RfD is an estimate of the highest daily oral exposure humans can be exposed to without resulting in harmful effects.

Where can you get more information?

Contact your state health or environmental department, or:

Agency for Toxic Substances and Disease Registry
Division of Toxicology
1600 Clifton Road, N.E., E-29
Atlanta, Georgia 30333

References

1. U.S. Environmental Protection Agency. *Health Effects Notebook for Hazardous Air Pollutants, 1,2,4-Trichlorobenzene,* Office of Air Planning & Standards, 1994.
2. U.S. Environmental Protection Agency. *OPPT Chemical Fact Sheet, 1,2,4-Trichlorobenzene (TCB) Fact Sheet: Support Document.* Washington, D.C.: Office of Pollution Prevention and Toxics, 1994.
3. U.S. Department of Health and Human Services. Hazardous Substances Data Bank (HSDB, online database). National Library of Medicine Bethesda, MD, 2001.

2,4,5-Trichlorophenol

CAS Number: 95-95-4

What is 2,4,5-trichlorophenol?

Grey in color and flaky in appearance; 2,4,5-trichlorophenol also looks like small needles. It has a really strong odor that smells like phenol (a poisonous crystal-looking compound). This man-made substance is not found naturally in the environment.

What is 2,4,5-trichlorophenol used for?

2,4,5- Trichlorophenol has several uses. The paper and pulp mills use 2,4,5- trichlorophenol as a fungicide to destroy or prevent fungi from growing. It is also used as a herbicide and to make other pesticides.

How can 2,4,5-trichlorophenol enter and leave your body?

2,4,5-Trichlorophenol can get into your body when you breathe contaminated air or it can be absorbed (pass through) by your skin if you touch it.

How can you be exposed to 2,4,5-trichlorophenol?

2,4,5-Trichlorophenol can be released into the air while it is being produced. It can also be released if it is burned. You can be exposed if you breathe contaminated air or touch 2,4,5-trichlorophenol. The most common source of exposure is for individuals who work in an industry that makes 2,4,5-trichlorophenol or for individuals responsible for applying pesticides. Low levels of 2,4,5-trichlorophenol can be found in air, food and in drinking water.

What are the health effects of exposure to 2,4,5-trichlorophenol?

If your skin comes into contact with 2,4,5-trichlorophenol, it may burn. It can also irritate your eyes, nose, pharynx and your lungs if you breathe it.

What levels of exposure have resulted in harmful health effects?

There is no information on the effects of long-term exposure to 2,4,5-trichlorophenol on humans. However, animal studies show that long-term exposure in rats through diet caused some slight decline in the liver and kidneys. No information is available on whether 2,4,5-trichlorophenol can cause cancer in humans. The U.S. Environmental Protection Agency has determined that 2,4,5-trichlorophenol is not classifiable regarding the likelihood of it causing cancer.

Where can you get more information?

Contact your state health or environmental department, or:

Agency for Toxic Substances and Disease Registry
Division of Toxicology
1600 Clifton Road, N.E., E-29
Atlanta, Georgia 30333

References

1. U.S. Environmental Protection Agency. *Health Effects Notebook, for Hazardous Air Pollutants, 2,4,5-Trichlorophenol.* Washington, D.C.: Office of Air Quality Planning and Standards. 1994.

2. U.S. Department of Health and Human Services. Hazardous Substances Data Bank (HSDB, online database). National Library of Medicine Bethesda, MD, 2001.

4-Bromophenyl phenyl ether

CAS Number: 101-55-3

What is 4-bromophenyl phenyl ether?

4-Bromophenyl phenyl ether is found in liquid form. No other information about its appearance is available.

What is 4-bromophenyl phenyl ether used for?

4-Bromophenyl phenyl ether is primarily used for research purposes. In the past it was used as a flame retardant.

How can 4-bromophenyl phenyl ether enter and leave your body?

4-Bromophenyl phenyl ether can enter your body if you breathe contaminated air or drink contaminated water. It can also be absorbed through your skin.

How can you be exposed to 4-bromophenyl phenyl ether?

The primary source of exposure to 4-bromophenyl phenyl ether is from the work place. If you work in an industry that makes or uses 4-bromophenyl phenyl ether, you are at greater risk of exposure through inhalation and dermal contact. In addition, the general population is most likely to be exposed to 4-bromophenyl phenyl ether by drinking contaminated water or by touching products that contain the substance.

What are the health effects of exposure to 4-bromophenyl phenyl ether?

Information on the clinical effects of 4-bromophenyl phenyl ether is not available. The U.S. Environmental Protection Agency has indicated that 4-bromophenyl phenyl ether cannot be classified as a cancer-causing substance because inadequate information exists.

What levels of exposure have resulted in harmful health effects?

No information available.

Where can you get more information?

Contact your state health or environmental department or:

Agency for Toxic Substances and Disease Registry
Division of Toxicology
1600 Clifton Road, N.E., E-29
Atlanta, Georgia 30333

References

1. U.S. Department of Health and Human Services. Hazardous Substances Data Bank (HSDB, online database). National Library of Medicine Bethesda, MD, 2001

Acenaphthene

CAS Number: 83-32-9

What is acenaphthene?

Acenaphthene is one of a group of chemicals called polycyclic aromatic hydrocarbons, PAHs for short. PAHs are often found together in groups of two or more. They can exist in over 100 different combinations but the most common are treated as a group of 15. PAHs are found naturally in the environment but they can also be man-made. Acenaphthene looks like a white crystal-like solid. PAHs are created when products like coal, oil, gas, and garbage are burned but the burning process is not complete.

Very little information is available on the individual chemicals within the PAH group. Most of the information available is for the PAH group as a whole. Information specific to acenaphthene is included in this fact sheet when available.

What is acenaphthene used for?

Most of the PAHs are used to conduct research. Like most PAHs, acenaphthene is used to make dyes, plastics and pesticides. Acenaphthene has been found in cigarette smoke, in the exhaust from automobiles and in wood preservatives.

How can acenaphthene enter and leave your body?

One of the most common ways acenaphthene can enter your body is through breathing contaminated air. It can get into your lungs when you breathe it. If you live near or work in a hazardous waste site where PAHs are disposed, you are likely to breathe acenaphthene and other PAHs. If you eat or drink food and water that are contaminated with PAHs, you could be exposed.

Exposure can also occur if your skin comes into contact with contaminated soil or products like heavy oils, coal tar, roofing tar or creosote where PAHs have been found. Creosote is an oily liquid found in coal tar and is used to preserve wood. Once in your body, the PAHs can spread and target fat tissues. Target organs include kidneys, liver and fat. However, in just a matter of days, the PAHs will leave your body through urine and feces.

How can you be exposed to acenaphthene?

You can be exposed to most PAHs in the environment, in your home and in the workplace. Because PAHs exist naturally in the environment, and they are man-made, you can be exposed in a number of ways. Acenaphthene has been detected in fumes from vehicle exhaust, coal, coal tar, and at hazardous waste sites. These are all sources of exposure.

Since acenaphthene has been found in cigarettes, you can be exposed by breathing cigarette and tobacco smoke. Exposure to other PAHs can occur by eating foods grown in contaminated soil or by eating meat or other food that you grilled. Grilling and charring food actually increases the amount of PAHs in the food.

If you work in a plant that makes coal-tar or that uses petroleum or coal, or makes or uses wood preservatives, you could be exposed to acenaphthene and other PAHs.

What are the health effects of exposure to acenaphthene?

A number of PAHs have caused tumors in laboratory animals that were exposed to PAHs through their food, from breathing contaminated air

and when it was applied to their skin. When pregnant mice ate high doses of a PAH (benzo(a)pyrene) they experienced reproductive problems. In addition, the offspring of the pregnant mice showed birth defects and a decrease in their body weight. Other effects include damage to skin, body fluids and the immune system which helps the body fight disease. However, these effects have not been seen in humans.

What levels of exposure have resulted in harmful health effects?

Acenaphthene can bother your skin and mucous membranes. Animal studies showed that rats fed 2 grams of acenaphthene for 32 days (long-term) had changes in their blood and some damage to the liver, kidney and lungs.

There is no information available from studies on humans to tell what effects can result from being exposed to individual PAHs at certain levels. However, breathing PAHs and skin contact seem to be associated with cancer in humans. Animal studies showed that mice exposed to 308 parts per million (ppm) of PAHs (specifically benzo(a)pyrene) in food for 10 days (short-term exposure) had offspring with birth defects. Mice exposed to 923 ppm of benzo(a)pyrene in food for a period of months developed problems in the liver and blood.

Where can you get more information?

Contact your state health or environmental department, or:

Agency for Toxic Substances and Disease Registry
Division of Toxicology
1600 Clifton Road, N.E., E-29
Atlanta, Georgia 30333

References

1. Agency for Toxic Substances and Disease Registry (ATSDR). *Public Health Statement, Polycyclic Aromatic Hydrocarbons.* Atlanta, GA: U.S. Department of Health and Human Services, 1990.
2. Faust, Rosmarie A., Oak Ridge National Laboratory, Chemical Hazard Evaluation Group. *Toxicity Summary for Acenaphthene.* Oak Ridge, TN:1994.
3. U.S. Department of Health and Human Services. Hazardous Substances Data Bank (HSDB, online database). National Library of Medicine Bethesda, MD, 2001.

Acenaphthylene

CAS Number: 208-96-8

What is acenaphthylene?

Acenaphthylene is one of a group of chemicals called polycyclic aromatic hydrocarbons, PAHs for short. PAHs are often found together in groups of two or more. They can exist in over 100 different combinations but the most common are treated as a group of 15. PAHs are found naturally in the environment but they can also be man-made. PAHs are solid and range in appearance from colorless to white or pale yellow-green. PAHs are created when products like coal, oil, gas, and garbage are burned but the burning process is not complete.

Very little information is available on the individual chemicals within the PAH group. Most of the information available is for the PAH group as a whole. Information specific to acenaphthylene is included in this fact sheet when available.

What is acenaphthylene used for?

Most of the PAHs are used to conduct research. Like most PAHs, acenaphthylene is used to make dyes, plastics and pesticides.

How can acenaphthylene enter and leave your body?

One of the most common ways acenaphthylene can enter your body is through breathing contaminated air. It can get into your lungs when you breathe it. If you work in a hazardous waste site where PAHs are disposed, you are likely to breathe acenaphthylene and other PAHs. If you eat or drink food and water that are contaminated with PAHs, you could be exposed.

Exposure can also occur if your skin comes into contact with contaminated soil or products like heavy oils, coal tar, roofing tar or creosote where PAHs have been found. Creosote is an oily liquid found in coal tar and is used to preserve wood. Once in your body, the PAHs can spread and target fat tissues. Target organs include kidneys, liver and fat. However, in just a matter of days, the PAHs will leave your body through urine and feces.

How can you be exposed to acenaphthylene?

You can be exposed to PAHs in the environment, in your home and in the work place. Because PAHs exist naturally in the environment, and they are man-made, you can be exposed in a number of ways. Fumes from vehicle exhaust, coal, coal tar, asphalt, wildfires, agricultural burning and hazardous waste sites are all sources of exposure.

You could be exposed to PAHs by breathing cigarette and tobacco smoke, eating foods grown in contaminated soil or by eating meat or other food that you grilled. Grilling and charring food actually increases the amount of PAHs in the food.

If you work in a plant that makes coal tar, asphalt and aluminum, or that burns trash, you can be exposed to PAHs. You can also be exposed if you work in a facility that uses petroleum or coal or where wood, corn and oil are burned.

What are the health effects of exposure to acenaphthylene?

A number of PAHs have caused tumors in laboratory animals that were exposed to PAHs through their food, from breathing contaminated air and when it was applied to their skin. When pregnant mice ate high doses of a PAH (benzo(a)pyrene), they experienced reproductive problems. In addition, the offspring of the pregnant mice showed birth defects and a decrease in their body weight. Other effects include damage

to skin, body fluids and the immune system which helps the body fight disease. However, these effects have not been seen in humans.

What levels of exposure have resulted in harmful health effects?

There is no information available from studies on humans to tell what effects can result from being exposed to individual PAHs at certain levels. However, breathing PAHs and skin contact seem to be associated with cancer in humans. Animal studies showed that mice exposed to 308 parts per million (ppm) of PAHs (specifically benzo(a)pyrene) in food for 10 days (short term exposure) had offspring with birth defects. Mice exposed to 923 ppm of benzo(a)pyrene in food for several months caused problems in the liver and blood.

The U.S. Environmental Protection Agency has indicated that not enough information exists to classify acenaphthylene as a cancer causing substance.

Where can you get more information?

Contact your state health or environmental department, or:

Agency for Toxic Substances and Disease Registry
Division of Toxicology
1600 Clifton Road, N.E., E-29
Atlanta, Georgia 30333

References

1. Agency for Toxic Substances and Disease Registry (ATSDR). *Public Health Statement, Polycyclic Aromatic Hydrocarbons.* Atlanta, GA: U.S. Department of Health and Human Services, 1990.
2. U.S. Department of Health and Human Services. Hazardous Substances Data Bank (HSDB, online database). National Library of Medicine Bethesda, MD, 2001.

Anthracene

CAS Number: 120-12-7

What is anthracene?

Anthracene is one of a group of chemicals called polycyclic aromatic hydrocarbons, PAHs for short. PAHs are often found together in groups of two or more. They can exist in over 100 different combinations but the most common are treated as a group of 15. PAHs are found naturally in the environment but they can also be man-made. Anthracene can vary in appearance from a colorless to pale yellow crystal-like solid. PAHs are created when products like coal, oil, gas, and garbage are burned but the burning process is not complete.

Very little information is available on the individual chemicals within the PAH group. Most of the information available is for the PAH group as a whole. Information specific to anthracene is included in this fact sheet when available.

What is anthracene used for?

Most of the PAHs are used to conduct research. Like most PAHs, anthracene is used to make dyes, plastics and pesticides. It has been used to make smoke screens and scintillation counter crystals. A scintillation counter is used to detect or count the number of sparks or flashes that occur over a period of time.

How can anthracene enter and leave your body?

One of the most common ways anthracene can enter your body is through breathing contaminated air. It can get into your lungs when you breathe it. If you work in a hazardous waste site where PAHs are disposed, you are likely to breathe anthracene and other PAHs. If you eat or drink food and water that are contaminated with PAHs, you could be exposed.

Exposure can also occur if your skin comes into contact with contaminated soil or products like heavy oils, coal tar, roofing tar or creosote where PAHs have been found. Creosote is an oily liquid found in coal tar and is used to preserve wood. Once in your body, the PAHs can spread and target fat tissues. Target organs include the kidneys, the liver and fat. However, in just a matter of days, the PAHs will leave your body through urine and feces.

How can you be exposed to anthracene?

You can be exposed to most PAHs in the environment, in your home and in the workplace. Because PAHs exist naturally in the environment, and they are man-made, you can be exposed in a number of ways. Anthracene has been detected in fumes from vehicle exhaust, coal, coal tar, and at hazardous waste sites. These are all sources of exposure. Since anthracene has been found in cigarettes, you can be exposed by breathing cigarette and tobacco smoke. Exposure to other PAHs can occur by eating foods grown in contaminated soil or by eating meat or other food that you grilled. Grilling and charring food actually increases the amount of PAHs in the food. If you work in a plant that makes coal-tar or that uses petroleum or coal or makes or uses wood preservatives, you could be exposed to anthracene and other PAHs.

What are the health effects of exposure to anthracene?

Once inside your body, anthracene appears to target the skin, blood, stomach and intestines and the lymph system. Exposure to high doses of

anthracene for a short time can cause damage to the skin. It can cause burning, itching and edema, a build up of fluid in tissues. Humans exposed to anthracene experienced headaches, nausea, loss of appetite, inflammation or swelling of the stomach and intestines. In addition, their reaction time slowed and they felt weak.

A number of PAHs have caused tumors in laboratory animals that were exposed to PAHs through their food, from breathing contaminated air and when it was applied to their skin. When pregnant mice ate high doses of a PAH (benzo(a)pyrene) they experienced reproductive problems. In addition, the offspring of the pregnant mice showed birth defects and a decrease in their body weight. Other effects include damage to skin, body fluids and the immune system, which helps the body fight disease. However, these effects have not been seen in humans.

What levels of exposure have resulted in harmful health effects?

There is no information available from studies on humans to tell what effects can result from being exposed to individual PAHs at certain levels. However, breathing PAHs and skin contact seem to be associated with cancer in humans. Animal studies showed that mice exposed to 308 parts per million (ppm) of PAHs (specifically benzo (a) pyrene) in food for 10 days (short term exposure) had offspring with birth defects. Mice exposed to 923 ppm of benzo (a) pyrene in food for months developed problems in the liver and blood.

The U.S. Environmental Protection Agency has indicated that not enough information exists to classify anthracene as a cancer causing substance.

Where can you get more information?

Contact your state health or environmental department, or:

Agency for Toxic Substances and Disease Registry
Division of Toxicology
1600 Clifton Road, N.E., E-29
Atlanta, Georgia 30333

References

1. Agency for Toxic Substances and Disease Registry (ATSDR). *Public Health Statement, Polycyclic Aromatic Hydrocarbons.* Atlanta, GA: U.S. Department of Health and Human Services, 1990.
2. Faust, Rosmarie A., Oak Ridge National Laboratory, Chemical Hazard Evaluation Group. *Toxicity Summary for Anthracene.* Oak Ridge, TN:1991.

Benzo(g,h,i)perylene

CAS Number: 191-24-2

What is benzo(g,h,i)perylene?

Benzo(g,h,i)perylene is one of a group of chemicals called polycyclic aromatic hydrocarbons, PAHs for short. PAHs are often found together in groups of two or more. They can exist in over 100 different combinations but the most common are treated as a group of 15. PAHs are found naturally in the environment but they can also be man-made. Benzo(g,h,i)perylene is a colorless crystal-like solid. PAHs are created when products like coal, oil, gas, and garbage are burned but the burning process is not complete.

Very little information is available on the individual chemicals within the PAH group. Most of the information available is for the PAH group as a whole. Information specific to benzo(g,h,i)perylene is included in this fact sheet when available.

What is benzo(g,h,i)perylene used for?

Most of the PAHs are used to conduct research. Like most PAHs, benzo(g,h,i)perylene is used to make dyes, plastics, pesticides, explosives and drugs. It has also been used to make bile acids, cholesterol and steroids.

How can benzo(g,h,i)perylene enter and leave your body?

One of the most common ways benzo(g,h,i)perylene can enter your body is through breathing contaminated air. It can get into your lungs when you breathe it. If you work in a hazardous waste site where PAHs are disposed, you are likely to breathe benzo(g,h,i)perylene and other PAHs. If you eat or drink food and water that is contaminated with PAHs, you could be exposed. Exposure can also occur if your skin comes into contact with contaminated soil or products like heavy oils, coal tar, roofing tar or creosote where PAHs have been found. Creosote is an oily liquid found in coal tar and is used to preserve wood. Once in your body, the PAHs can spread and target fat tissues. Target organs include kidneys, liver and fat. However, in just a matter of days, the PAHs will leave your body through urine and feces.

How can you be exposed to benzo(g,h,i)perylene?

You can be exposed to PAHs in the environment, in your home and in the work place. Because PAHs exist naturally in the environment, and they are man-made, you can be exposed in a number of ways. Fumes from vehicle exhaust, coal, coal tar, asphalt, wildfires, agricultural burning and hazardous waste sites are all sources of exposure.

You could be exposed to PAHs by breathing cigarette and tobacco smoke, eating foods grown in contaminated soil or by eating meat or other food that you grilled. Grilling and charring food actually increases the amount of PAHs in the food. If you work in a plant that makes coal tar, asphalt and aluminum, or that burns trash, you can be exposed to PAHs. You can also be exposed if you work in a facility that uses petroleum or coal or where wood, corn and oil are burned.

What are the health effects of exposure to benzo(g,h,i)perylene?

A number of PAHs have caused tumors in laboratory animals that were exposed to PAHs through their food, from breathing contaminated air and when it was applied to their skin. When pregnant mice ate high doses of a PAH (benzo (a) pyrene) they experienced reproductive problems. In addition, the offspring of the pregnant mice

showed birth defects and a decrease in their body weight. Other effects include damage to skin, body fluids and the immune system which helps the body fight disease. However, these effects have not been seen in humans.

What levels of exposure have resulted in harmful health effects?

There is no information available from studies on humans to tell what effects can result from being exposed to individual PAHs at certain levels. However, breathing PAHs and skin contact seem to be associated with cancer in humans. Animal studies showed that mice exposed to 308 parts per million (ppm) of PAHs (specifically benzo (a) pyrene) in food for 10 days (short-term exposure) had offspring with birth defects. Mice exposed to 923 ppm of benzo(a)pyrene in food for months developed problems in the liver and blood.

The U.S. Environmental Protection Agency has indicated that not enough information exists to classify benzo(g,h,i)perylene as a cancer causing substance.

Where can you get more information?

Contact your state health or environmental department, or:

Agency for Toxic Substances and Disease Registry
Division of Toxicology
1600 Clifton Road N.E., E-29
Atlanta, Georgia 30333

References

1. Agency for Toxic Substances and Disease Registry (ATSDR). *Public Health Statement, Polycyclic Aromatic Hydrocarbons.* Atlanta, GA: U.S. Department of Health and Human Services, 1990.
2. Faust, Rosmarie A., Oak Ridge National Laboratory, Chemical Hazard Evaluation Group. *Toxicity Summary for Benzo(g,h,i) perylene.* Oak Ridge, TN:1994.
3. U.S. Department of Health and Human Services. Hazardous Substances Data Bank (HSDB, online database). National Library of Medicine Bethesda, MD, 2001.

Cadmium

CAS Number: 7440-43-9

What is cadmium?

Cadmium, in its purest form, is a soft silver-white metal that is found naturally in the earth's crust. However, the most common forms of cadmium found in the environment exist in combinations with other elements. For example, cadmium oxide (a mixture of cadmium and oxygen), cadmium chloride (a combination of cadmium and chlorine), and cadmium sulfide (a mixture of cadmium and sulfur) are commonly found in the environment. Cadmium doesn't have a distinct taste or smell.

What is cadmium used for?

Most cadmium used in this country is obtained as a by-product (formed while making something else) from smelting (melting) zinc, lead, or copper ores. The cadmium by-product is mostly used in metal plating and to make pigments, batteries, and plastics.

How can cadmium enter and leave your body?

Cadmium can get into your blood stream by eating and drinking cadmium-contaminated food or water and by breathing cadmium-contaminated air.

How can you be exposed to cadmium?

You can be exposed to cadmium in the work place by breathing cadmium-contaminated air. If you work for a battery manufacturer or work in metal soldering or welding, then workplace exposure to cadmium may be greater.

Exposure can also occur by eating foods containing low levels of cadmium. For most of us, the most common source of exposure to cadmium is mainly through eating food, especially shellfish, liver, and kidney meats. Plants absorb or "take up" cadmium from soil, and the fish we eat "take up" cadmium from the water they live in. However, this type of exposure is not of greatest concern.

Cigarette smoke is another source of exposure. Traces of cadmium can be found in tobacco plants. Most people who smoke have about twice as much cadmium in their bodies as nonsmokers.

Breathing cadmium-contaminated air from industry sectors that burn fossil fuels like coal or oil, or that burn municipal wastes is another source of exposure and is the largest source of cadmium releases. Cadmium may also be released to the air from zinc, lead or copper smelters. If you work in or near these major sources of cadmium releases, then your exposure to cadmium may be higher than the average person.

What are the health effects of exposure to cadmium?

Exposure to cadmium can cause a number of harmful health effects. Eating food or drinking water with high levels of cadmium can severely irritate or bother your stomach and cause vomiting and diarrhea. Breathing high doses of cadmium can irritate and damage the lungs and can cause death.

However, the greatest concern is from exposure to lower doses of cadmium over a long period of time. The lower and long-term exposure to cadmium through air or through diet can cause kidney damage. Although the damage is not life-threatening, it can lead to the formation of kidney stones and affect the skeleton, which can be painful and debilitating. Lung damage has also been observed.

The results of some animal studies show that animals given cadmium-contaminated food and

water show high blood pressure, iron-poor blood, liver disease, nerve damage or brain damage. These effects have not been observed in humans.

The U.S. Department of Health and Human Services determined that cadmium and certain cadmium compounds are probable or suspected carcinogens (substances that cause cancer).

What levels of exposure have resulted in harmful health effects?

In general, the amount of cadmium that will cause health problems will vary depending on: (1) the type of exposure (eating or breathing), (2) the duration of the exposure (short- or long-term), and (3) the form of cadmium (pure cadmium or some combination).

Studies show that humans can experience lung irritation after breathing as little as 1.0 milligrams per cubic meter of air (mg/m^3) of cadmium-contaminated air for a short period of time (less than or equal to 14 days).

Breathing 0.01 mg/m^3 of cadmium-contaminated air over the long-term (greater than 14 days) has resulted in chronic lung disease and kidney disease in humans.

Humans that eat or drink cadmium-contaminated food and water for a short period of time (less than 14 days) in amounts of 0.05 milligrams per kilogram of body weight per day (mg/kg/day) can experience stomach irritation. Long-term exposure (greater than 14 days) in amounts of 0.005 mg/kg/day cause relatively little risk of injury to the kidney or other tissues.

Exposure to cadmium through food is typical for most people but is not a major health concern. This is because the cadmium present in the body from our diet is about 0.0004 mg/kg/day. This figure is about ten times lower than the level of cadmium that causes kidney damage from eating contaminated food.

Where can you get more information?

Contact your state health or environmental department, or:

Agency for Toxic Substances and Disease Registry
Division of Toxicology
1600 Clifton Road N.E., E-29
Atlanta, Georgia 30333

References

1. Agency for Toxic Substances and Disease Registry (ATSDR). *Public Health Statement for Cadmium.* Atlanta, GA: U.S. Department of Health and Human Services, 1989.
2. Agency for Toxic Substances and Disease Registry (ATSDR). *Toxicological Profile for Cadmium.* Atlanta, GA: U.S. Department of Health and Human Services, 1993.
3. Reigart, Routt J. and Roberts, James R. Medical University of South Carolina. *Recognition and Management of Pesticide Poisonings.* Fifth ed. Washington, D.C.: U.S. Environmental Protection Agency, Office of Pesticide Programs, 1999.

Dibenzofuran

CAS Number: 132-64-9

What is dibenzofuran?

Dibenzofuran is a white crystal-like solid that is created from the production of coal tar.

What is dibenzofuran used for?

Dibenzofuran is used as an insecticide and to make other chemicals. It is made from coal tar and has been found in coke dust, grate ash, fly ash, and flame soot.

How can it enter and leave your body?

Dibenzofuran can enter your body when you breathe contaminated air. It can also be absorbed into your body when it comes into contact with your skin.

How can you be exposed to dibenzofuran?

You can be exposed to dibenzofuran by breathing contaminated air or by eating or drinking contaminated food or water. Since it has been found in tobacco smoke, you can be exposed if you smoke cigarettes or breathe cigarette smoke.

In addition, you can be exposed to dibenzofuran if you work in an industry that makes or uses coal tar.

What are the health effects of exposure to dibenzofuran?

Little to no information is available on the effects of dibenzofuran exposure to your health. However, the information that does exist shows that short-term exposure to dibenzofuran can cause skin, eye, nose, and throat irritation.

What levels of exposure can result in harmful health effects?

Very little information is available on the levels of exposure that will cause harmful effects. In addition to the skin, eye, nose and throat irritation caused by short-term exposure; long-term exposure can cause rashes and growths to appear on your skin. Your skin may also change color.

The U.S. Environmental Protection Agency has determined that there is not enough information available to classify dibenzofuran as a cancer causing substance.

Where can you get more information?

If you have more questions or concerns, you can contact your state health or environmental department or:

Agency for Toxic Substances and Disease Registry
Division of Toxicology
1600 Clifton Road, N.E., E-29
Atlanta, Georgia 30333

References

1. New Jersey Department of Health and Senior Services. *Hazardous Substance Fact Sheet: Dibenzofuran.* Trenton, NJ: 1998.
2. U.S. Environmental Protection Agency. *Health Effects Notebook for Hazardous Air Pollutants, Dibenzofuran,* Office of Air Planning & Standards, 1994.

Dioxins and Furans

What are dioxins and furans?

Dioxins and furans is the abbreviated or short name for a family of toxic substances that all share a similar chemical structure. Dioxins, in their purest form, look like crystals or a colorless solid. Most dioxins and furans are not man-made or produced intentionally, but are created when other chemicals or products are made. Of all of the dioxins and furans, one, 2,3,7,8-tetrachloro-p-dibenzo-dioxin (2,3,7,8 TCDD) is considered the most toxic.

What are dioxins and furans used for?

Dioxins and furans are not made for any specific purpose; however, they are created when products like herbicides are made. They are also created in the pulp and paper industry, from a process that bleaches the wood pulp. In addition, they can be produced when products are burned.

How can dioxins and furans enter and leave your body?

Dioxins and furans can enter your body through breathing contaminated air, drinking contaminated water or eating contaminated food. About 90% of exposure to dioxins and furans is from eating contaminated food. Dioxins and furans can build up in the fatty tissues of animals.

How can you be exposed to dioxins and furans?

You can be exposed to dioxins and furans by eating contaminated food. Dioxins and furans typically stay and build up in the fatty tissues of animals. This means that eating beef, pork, poultry, fish as well as dairy products can be a source of exposure.

There are several sources of exposure to dioxins and furans. If you work in or near a municipal solid waste incinerator, copper smelter, cement kiln or coal fired power plant you can be exposed to dioxins and furans. Individuals who burn their household waste or burn wood can be exposed as well. Even forest fires can contribute to the creation of small amounts of dioxins and furans.

Dioxins and furans have been found in the air, soil, and food. Dioxins and furans are mainly distributed through the air. However, only a small percentage of exposure is from air. Eating contaminated food is the primary source of exposure.

What are the health effects of exposure to dioxins and furans?

Dioxins and furans can cause a number of health effects. The most well known member of the dioxins/furans family is 2,3,7,8 TCDD. The U.S. Environmental Protection Agency (EPA) has said that it is likely to be a cancer causing substance to humans. In addition, people exposed to dioxins and furans have experienced changes in hormone levels. High doses of dioxin have caused a skin diseased called chloracne. Animal studies show that animals exposed to dioxins and furans experienced changes in their hormone systems, changes in the development of the fetus, decreased ability to reproduce and suppressed immune system.

What levels of exposure have resulted in harmful health effects?

The U.S. EPA has set a limit of 0.00003 micrograms of 2,3,7,8-TCDD per liter of drinking water (ug/L). The Food and Drug Administration recommends not eating fish and shell fish with

more than 50 parts per trillion (50 ppt) of 2,3,7,8-TCDD.

Where can you get more information?

Contact your state health or environmental department, or:

Agency for Toxic Substances and Disease Registry
Division of Toxicology
1600 Clifton Road, N.E., E-29
Atlanta, Georgia 30333

References

1. Agency for Toxic Substances and Disease Registry (ATSDR). *Toxicological Profile, Chlorinated Dibenzo-p-Dioxins (CDDs).* Atlanta, GA: U.S. Public Health Service, U.S. Department of Health and Human Services, 1999.
2. Chiefs of Ontario, Effects on Aboriginals from the Great Lakes Environment Project (EAGLE). *Fact Sheet 11: Dioxins and Furans* http://www.chiefs-of-ontario.org/eagle/factsheet11.htm
3. U.S. Environmental Protection Agency. *Priority PBTs : Dioxins and Furans Fact Sheet.* Washington, D.C.: Office of Pollution Prevention and Toxics.
4. U.S. Department of Health and Human Services. Hazardous Substances Data Bank (HSDB, online database). National Library of Medicine Bethesda, MD, 2001.

Endosulfan, alpha

CAS Number: 95-99-98

What is endosulfan, alpha?

Endosulfan, alpha is one form of another substance called endosulfan. It looks like a brown-colored crystal and has an odor like turpentine. Since endosulfan, alpha has the same chemical structure as endosulfan, much of the information included in this fact sheet is based on the information available for endosulfan.

What is endosulfan, alpha used for?

Endosulfan, alpha is used as an insecticide on crops. Teas, grains, cotton, fruit, vegetables and tobacco are examples of crops that are treated with endosulfan, alpha. It has also been used specifically in the United States as a wood preservative to protect wood from decay and insect attack. Endosulfan has not been produced in the United States since 1982, but it has been used to make other chemicals.

How can endosulfan, alpha enter and leave your body?

Endosulfan, alpha can enter your body when you breathe contaminated air. It can be absorbed into your body when it comes in contact with your skin. Endosulfan can leave your body through urine just a few days after exposure.

How can you be exposed to endosulfan, alpha?

You can be exposed to endosulfan by breathing contaminated air or by eating or drinking contaminated food or water. Tobacco plants/crops that have been sprayed with endosulfan can be another source of exposure. It is possible that you can be exposed if you smoke cigarettes or breathe cigarette smoke. You can also be exposed to endosulfan, alpha if you work in an industry that makes or uses it.

What are the health effects of exposure to endosulfan, alpha?

The central nervous system is the primary target affected by exposure to endosulfan. Breathing, eating or drinking high doses of endosulfan can cause convulsions (shaking violently) and death. You could also experience tremors, become hyperactive or see a decrease in breathing and your ability to produce saliva.

The affects of being exposed to low doses of endosulfan, alpha over a long period of time are not known. However, animals exposed to low doses of endosulfan experienced a number of effects including reduced ability of the immune system to fight infection, problems with the liver and kidneys, problems with the testes in males, and the developing fetus in females. The U.S. Environmental Protection Agency (EPA), the Department of Health and Human Services and the International Agency for Research on Cancer have not classified endosulfan as a cancer-causing substance.

What levels of exposure can result in harmful health effects?

The EPA prohibits no more than 0.1 to 2.0 parts per million (ppm) of endosulfan to be present in food. The Food and Drug Administration recommends that no more that 24 ppm be found in dry tea. The Occupational Safety and Health Administration has set a workplace exposure limit so that a worker will not be exposed to more than 0.1 milligrams of endosulfan per cubic meter for an 8 hour work day, and a 40 hour work week.

Where can you get more information?

Contact your state health or environmental department, or:

Agency for Toxic Substances and Disease Registry
Division of Toxicology
1600 Clifton Road, N.E., E-29
Atlanta, Georgia 30333

References

1. Agency for Toxic Substances and Disease Registry (ATSDR). *Toxicological Profile for Endosulfan.* Atlanta, GA: U.S. Public Health Service, U.S. Department of Health and Human Services, 1995.
2. Reigart, Routt J. and Roberts, James R. Medical University of South Carolina. *Recognition and Management of Pesticide Poisonings.* Fifth ed. Washington, D.C.: U.S. Environmental Protection Agency, Office of Pesticide Programs, 1999.

Endosulfan, beta

CAS Number: 33213-65-9

What is endosulfan, beta?

Endosulfan, beta is one form of another substance called endosulfan. It looks like a brown-colored crystal and has an odor like turpentine. Since endosulfan, beta has the same chemical structure as endosulfan, much of the information included in this fact sheet is based on the information available for endosulfan.

What is endosulfan, beta used for?

Endosulfan, beta is used as an insecticide on crops. Teas, grains, cotton, fruit, vegetables and tobacco are examples of crops that are treated with endosulfan, beta. It has also been used specifically in the United States as a wood preservative to protect wood from decay and insect attack. Endosulfan has not been produced in the United States since 1982, but is has been used to make other chemicals.

How can endosulfan, beta enter and leave your body?

Endosulfan, beta can enter your body when you breathe contaminated air. It can be absorbed into your body when it comes into contact with your skin. Endosulfan can leave your body through urine just a few days after exposure.

How can you be exposed to endosulfan, beta?

You can be exposed to endosulfan by breathing contaminated air or by eating or drinking contaminated food or water. Tobacco plants/crops that have been sprayed with endosulfan could also be a source of exposure. It is possible that you can be exposed if you smoke cigarettes or breathe cigarette smoke. You can also be exposed to endosulfan, beta if you work in an industry that makes or uses it.

What are the health effects of exposure to endosulfan, beta?

The central nervous system is the primary target affected by exposure to endosulfan. Breathing, eating or drinking high doses of endosulfan can cause convulsions (shaking violently) and death. You could also experience tremors, become hyperactive or see a decrease in breathing and your ability to produce saliva.

The affects of being exposed to low doses of endosulfan, beta over a long period of time are not known. However, animals exposed to low doses of endosulfan experienced a number of effects including reduced ability of the immune system to fight infection, problems with the liver and kidneys, problems with the testes in males, and the developing fetus in females.

The U.S. Environmental Protection Agency (EPA), the Department of Health and Human Services and the International Agency for Research on Cancer have not classified endosulfan as a cancer-causing substance.

What levels of exposure can result in harmful health effects?

The EPA prohibits no more than 0.1 to 2.0 parts per million (ppm) of endosulfan to be present in food. The Food and Drug Administration recommend that no more that 24 ppm to be found in dry tea. The Occupational Safety and Health Administration has set a workplace exposure limit so that a worker will not be exposed to more than 0.1 milligrams of endosulfan per cubic meter for an 8 hour work day, and for a 40 hour work week.

Where can you get more information?

Contact your state health or environmental department, or:

Agency for Toxic Substances and Disease Registry
Division of Toxicology
1600 Clifton Road, N.E., E-29
Atlanta, Georgia 30333

References

1. Agency for Toxic Substances and Disease Registry (ATSDR). *Toxicological Profile for Endosulfan*. Atlanta, GA: U.S. Public Health Service, U.S. Department of Health and Human Services, 1995.
2. Reigart, Routt J. and Roberts, James R. Medical University of South Carolina. *Recognition and Management of Pesticide Poisonings*. Fifth ed. Washington, D.C.: U.S. Environmental Protection Agency, Office of Pesticide Programs, 1999.

Fluorene

CAS Number: 86-73-7

What is fluorene?

Fluorene is one of a group of chemicals called polycyclic aromatic hydrocarbons, PAHs for short. PAHs are often found together in groups of two or more. They can exist in over 100 different combinations but the most common are treated as a group of 15. PAHs are found naturally in the environment but they can also be man-made. PAHs are solid and range in appearance from colorless to white or pale yellow-green. PAHs are created when products like coal, oil, gas, and garbage are burned but the burning process is not complete.

Very little information is available on the individual chemicals within the PAH group. Most of the information available is for the PAH group as a whole. Information specific to fluorene is included in this fact sheet when available.

What is fluorene used for?

Most of the PAHs are used to conduct research. Like most PAHs, fluorene is used to make dyes, plastics and pesticides.

How can fluorene enter and leave your body?

One of the most common ways fluorene can enter your body is through breathing contaminated air. It can get into your lungs when you breathe it. If you work in a hazardous waste site where PAHs are disposed, you are likely to breathe fluorene and other PAHs. If you eat or drink food and water that are contaminated with PAHs, you could be exposed.

Exposure can also occur if your skin comes into contact with contaminated soil or products like heavy oils, coal tar, roofing tar or creosote where PAHs have been found. Creosote is an oily liquid found in coal tar and is used to preserve wood. Once in your body, the PAHs can spread and target fat tissues. Target organs include kidneys, liver and fat. However, in just a matter of days, the PAHs will leave your body through urine and feces.

How can you be exposed to fluorene?

You can be exposed to PAHs in the environment, in your home and in the work place. Because PAHs exist naturally in the environment, and they are man-made, you can be exposed in a number of ways. Fumes from vehicle exhaust, coal, coal tar, asphalt, wildfires, agricultural burning and hazardous waste sites are all sources of exposure.

You could be exposed to PAHs by breathing cigarette and tobacco smoke, eating foods grown in contaminated soil or by eating meat or other food that you grilled. Grilling and charring food actually increases the amount of PAHs in the food.

If you work in a plant that makes coal tar, asphalt and aluminum, or that burns trash, you can be exposed to PAHs. You can also be exposed if you work in a facility that uses petroleum or coal or where wood, corn and oil are burned.

What are the health affects of exposure to fluorene?

A number of PAHs have caused tumors in laboratory animals that were exposed to PAHs through their food, from breathing contaminated air and when it was applied to their skin. When pregnant mice ate high doses of a PAH (benzo(a)pyrene) they experienced reproductive problems. In addition, the offspring of the pregnant mice showed birth defects and a decrease

in their body weight. Other effects include damage to skin, body fluids and the immune system which helps the body fight disease. However, these effects have not been seen in humans.

What levels of exposure have resulted in harmful health effects?

There is no information available from studies on humans to tell what effects can result from being exposed to individual PAHs at certain levels. However, breathing PAHs and skin contact seem to be associated with cancer in humans. Animal studies showed that mice exposed to 308 parts per million (ppm) of PAHs (specifically benzo (a) pyrene) in food for 10 days (short term exposure) had offspring with birth defects. Mice exposed to 923 ppm of benzo(a)pyrene in food for months developed problems in the liver and blood. The U.S. Environmental Protection Agency (EPA) has indicated that not enough information exists to classify fluorene as a cancer-causing substance.

Where can you get more information?

Contact your state health or environmental department, or:

Agency for Toxic Substances and Disease Registry
Division of Toxicology
1600 Clifton Road, N.E., E-29
Atlanta, Georgia 30333

References

1. Agency for Toxic Substances and Disease Registry (ATSDR). *Public Health Statement, Polycyclic Aromatic Hydrocarbons.* Atlanta, GA: U.S. Department of Health and Human Services, 1990.

Hexachlorobenzene

CAS Number: 118-74-1

What is hexachlorobenzene?

Hexachlorobenzene, also known as HCB, is a white crystal-looking solid. It is not found naturally in the environment but is developed as a by-product, a result of making other chemicals.

What is HCB used for?

Until 1965, HCB was mostly used as a pesticide to protect against fungus. It was also used to make fireworks, ammunition, and synthetic rubber. However, using and intentionally making HCB is no longer allowed in the United States.

How can HCB enter and leave your body?

HCB can enter your body after you eat HCB-contaminated food, breathe HCB-contaminated air, or it can be absorbed through the skin. Within just a few hours of entering your body, HCB can spread to other tissues in the body. HCB will stay in the body for years, especially in fat tissues. When it does leave the body, it has been found in feces and in urine.

How can you be exposed to HCB?

You can be exposed to HCB if you breathe small HCB particles in the air or dust, if you work in an industry that makes HCB as a by-product or an industry where HCB is used or a waste dump where it is disposed.

You can be exposed to HCB if you eat or drink HCB-contaminated food (fish, meat, poultry) or liquids (milk). You can also be exposed if your skin comes in contact with HCB. Babies that are nursing can be exposed to HCB through their mother's breast milk.

What are the health effects of exposure to HCB?

Not much is known about the health effects caused from breathing HCB or from skin contact. However, some cases of a skin disorder called porphyria were reported after people in Turkey ate bread that was made using HCB contaminated-grain.

Evidence exists that HCB is toxic to young children. In fact, animal studies and experiments have confirmed the danger and have shown that HCB can decrease the survival rates for young children.

Other animal studies show that eating HCB-contaminated food over a long period of time can harm the liver, immune system, kidneys, and blood. It can cause the skin to erupt (break) and change in coloring. Some studies show that eating enough HCB over a long period of time can cause liver or thyroid cancer.

The U.S. Department of Health and Human Services determined that HCB is a probable or suspected carcinogen (substance that causes cancer).

What levels of exposure have resulted in harmful health effects?

The level of exposure resulting in harmful health effects is unknown.

However, animal studies suggest that humans who eat food containing 0.17 parts per million (ppm) of HCB for over 15 weeks or 0.029 ppm for 130 weeks may experience health effects. No information is available on short-term exposure.

When exposed to 769 ppm of HCB-contaminated food over 10 days (short-term exposure), the offspring of mice developed abnormally.

The long-term exposure of different animals (rats and monkeys) to different amounts of HCB-contaminated food ranging from 4 ppm to 1,600 ppm affected the immune system and liver in rats, decreased the survival in new born rats and caused lethargy, ataxia in monkeys. Ataxia is the loss of muscular coordination and control.

Where can you get more information?

Contact your state health or environmental department, or:

Agency for Toxic Substances and Disease Registry
Division of Toxicology
1600 Clifton Road, N.E., E-29
Atlanta, Georgia 30333

References

1. Agency for Toxic Substances and Disease Registry (ATSDR). *Public Health Statement for Hexachlorobenzene.* Atlanta, GA: U.S. Department of Health and Human Services, 1990.
2. Agency for Toxic Substances and Disease Registry (ATSDR). *Toxicological Profile for Hexachlorobenzene.* Atlanta, GA: U.S. Department of Health and Human Services, 1997.
3. Reigart, Routt J. and Roberts, James R. Medical University of South Carolina. *Recognition and Management of Pesticide Poisonings.* Fifth ed. Washington, D.C.: U.S. Environmental Protection Agency, Office of Pesticide Programs, 1999.

Heptachlor

CAS Number: 76-44-8

What is heptachlor?

Heptachlor is not found naturally in the earth. It is a man-made compound that looks like a white powder and smells like mothballs. Pure forms of heptachlor are white but less pure forms of this substance appear tan.

What is heptachlor used for?

Between the 1960s and 1970s heptachlor was used to kill termites found in the home, and farmers used it to kill insects found on farm crops, especially corn crops. In the late 1970s, the use of heptachlor was phased out. By 1988, the commercial sale of heptachlor was banned in the United States. The use of heptachlor is restricted to controlling fire ants in power transformers.

How can heptachlor enter and leave your body?

Heptachlor can get into your body by breathing contaminated air over a long period of time. It can also enter the body if you eat and drink food, water, or even milk that is contaminated with heptachlor.

Once in your body, heptachlor changes to heptachlor epoxide (a form of heptachlor that mixes with oxygen).

Nursing mothers who are exposed to heptachlor may pass the substance on to their babies while breast feeding.

Heptachlor can enter the body through skin contact. Because heptachlor is no longer commercially available, exposure through skin contact is very limited.

How can you be exposed to heptachlor?

Heptachlor tends to stay in soil for long periods of time. One study found heptachlor epoxide in crops that were grown in heptachlor-treated soil 15 years earlier. You can be exposed to heptachlor by eating these crops.

Because heptachlor is not widely available and its use is restricted, the greatest exposure is through the workplace. You can be exposed to heptachlor if you work in a job where it is made or at a hazardous waste site or landfill where it is disposed.

You can be exposed if heptachlor was used in your home to control termites. It is possible that traces of heptachlor could linger if applied to soil underground.

What are the health effects of exposure to heptachlor?

The health effects from exposure to heptachlor will vary depending on how much you are exposed to and the length of time.

There is very little information available about the short-term exposure to high doses of heptachlor to humans. But animal studies show that heptachlor is very toxic to humans and animals. Animals that were fed high levels of heptachlor during a short period of time experienced tremors and convulsions.

Not much information is available about the health effects on humans from long-term exposure to heptachlor. But animal studies suggest that long-term exposure can affect the liver. The animals studied have shown enlarged livers, damage to liver and kidney tissue, and increased red blood

cells. Animals also experienced tremors and convulsions. Animals that were fed heptachlor developed liver cancer.

Studies show that female rats exposed to heptachlor were less likely to become pregnant. Those that did become pregnant had smaller litters or the offspring showed developmental problems. When baby rats were fed heptachlor, they developed cataracts just after their eyes opened. Other studies show that heptachlor fed to animals caused cancer. The U.S. Environmental Protection Agency believes heptachlor is a probable cancer causing agent because of the results of a number of studies. However, another agency, the International Agency for Research on Cancer, does not classify heptachlor as cancer causing to humans because there is not enough data.

What levels of exposure can result in harmful health effects?

No data was found that could connect the level of exposure to heptachlor to a specific exposure route that caused harmful effects. There was no data available on the harmful effects from breathing heptachlor-contaminated air. The only information that was found was related to the health effects related to skin contact. Rats exposed to 195 to 250 milligrams per kilogram of body weight (mg/kg) of heptachlor died.

Where can you get more information?

Contact your state health or environmental department, or:

Agency for Toxic Substances and Disease Registry
Division of Toxicology
1600 Clifton Road, N.E., E-29
Atlanta, Georgia 30333

References:

1.
2. Agency for Toxic Substances and Disease Registry (ATSDR). *Public Health Statement for Heptachlor and Heptachlor Epoxide.* Atlanta, GA: U.S. Department of Health and Human Services, 1989.
3. Agency for Toxic Substances and Disease Registry (ATSDR). *Toxicological Profile for Heptachlor and Heptachlor Epoxide.* Atlanta, GA: U.S. Department of Health and Human Services, 1993.
4. Mississippi State University Extension Service, Farm Chemical Safety Series, Recognizing Pesticide Poisoning. http://msucares.com/pubs/pub1933.htm
5. Reigart, Routt J. and Roberts, James R. Medical University of South Carolina. *Recognition and Management of Pesticide Poisonings.* Fifth ed. Washington, D.C.: U.S. Environmental Protection Agency, Office of Pesticide Programs, 1999.

Heptachlor Epoxide

CAS Number: 1024-57-3

What is heptachlor epoxide?

Heptachlor epoxide is a man-made compound that looks like a white powder. Heptachlor epoxide is created when a substance called heptachlor is released to the environment and mixes with oxygen.

What is heptachlor epoxide used for?

Between the 1960s and 1970s heptachlor was used to kill termites found in the home and farmers used it to kill insects found on farm crops, especially corn crops. In the late 1970s, the use of heptachlor was phased out. By 1988, the commercial sale of heptachlor was banned in the United States. The use of heptachlor is restricted to controlling fire ants in power transformers.

How can heptachlor epoxide enter and leave your body?

Heptachlor can get into your body by breathing contaminated air over a long period of time. It can also enter the body if you eat and drink food, water, or even milk that is contaminated with heptachlor. Once in your body, heptachlor changes to heptachlor epoxide (a form of heptachlor that mixes with oxygen).

Nursing mothers who are exposed to heptachlor epoxide may pass the substance on to their babies while breast feeding.

Heptachlor epoxide can enter the body through skin contact. Because heptachlor is no longer commercially available, exposure through skin contact is very limited.

How can you be exposed to heptachlor epoxide?

Heptachlor tends to stay in soil for long periods of time. One study found heptachlor epoxide in crops that were grown in heptachlor-treated soil 15 years earlier. You can be exposed to heptachlor epoxide by eating these crops.

Because heptachlor is not widely available and its use is restricted, the greatest exposure is through the workplace. You can be exposed to heptachlor epoxide if you work in a job where heptachlor is made or at a hazardous waste site or landfill where it is disposed.

You can be exposed to heptachlor epoxide if heptachlor was used in your home to control termites. It is possible that traces of heptachlor could linger if applied to soil underneath your home.

What are the health affects of exposure to heptachlor epoxide affect your health?

The health effects from exposure to heptachlor epoxide will vary depending on how much you are exposed to and the length of time.

There is very little information available about the short-term exposure to high doses of heptachlor epoxide to humans. But animal studies show that heptachlor epoxide is very toxic to humans and animals. Animals that were fed high levels of heptachlor during a short period of time experienced tremors and convulsions.

Not much information is available about the health effects on humans from long-term exposure to heptachlor epoxide. But animal studies suggest that long-term exposure can affect the liver. The

animals studied have shown enlarged livers, damage to liver and kidney tissue, and increased red blood cells. Animals also experienced tremors and convulsions. Animals that were fed heptachlor developed liver cancer.

Studies show that female rats exposed to heptachlor were less likely to become pregnant. Those that did become pregnant had smaller litters or the offspring showed developmental problems. When baby rats were fed heptachlor, they developed cataracts just after their eyes opened. Other studies show that heptachlor fed to animals caused cancer. The Environmental Protection Agency believes heptachlor is a probable cancer causing agent because of the results of a number of studies. However, another agency, the International Agency for Research on Cancer does not classify heptachlor as cancer causing to humans because there is not enough data.

What levels of exposure can result in harmful health effects?

No data was found that could connect the level of exposure to heptachlor epoxide to a specific exposure route that caused harmful effects. There was no data available on the harmful effects from breathing heptachlor-contaminated air. The only information that was found was related to the health effects related to skin contact. Rats exposed to 195 to 250 milligrams per kilogram of body weight (mg/kg) of heptachlor died.

Where can you get more information?

Contact your state health or environmental department or:
Agency for Toxic Substances and Disease Registry
Division of Toxicology
1600 Clifton Road, N.E., E-29
Atlanta, Georgia 30333

References

1. Agency for Toxic Substances and Disease Registry (ATSDR). *Public Health Statement for Heptachlor and Heptachlor Epoxide.* Atlanta, GA: U.S. Department of Health and Human Services, 1989.
2. Agency for Toxic Substances and Disease Registry (ATSDR). *Toxicological Profile for Heptachlor and Heptachlor Epoxide.* Atlanta, GA: U.S. Department of Health and Human Services, 1993.
3. Mississippi State University Extension Service, Farm Chemical Safety Series, Recognizing Pesticide Poisoning. http://msucares.com/pubs/pub1933.htm
4. Reigart, Routt J. and Roberts, James R. Medical University of South Carolina. *Recognition and Management of Pesticide Poisonings.* Fifth ed. Washington, D.C.: U.S. Environmental Protection Agency, Office of Pesticide Programs, 1999.

Hexachloroethane

CAS Number: 67-72-1

What is hexachloroethane?

Colorless and solid in appearance, hexachloroethane slowly turns into a vapor when it is exposed to the air and smells like mothballs. Hexachloroethane is not found naturally in the environment, but it can be formed when making other chemicals. This is called a by-product.

What is hexachloroethane used for?

Hexachloroethane is mostly used by the military to make weapons that produce smoke, like smoke pots and grenades used during training. It is also present as an ingredient in fungicides, insecticides, lubricants and plastics. Although hexachloroethane is no longer made in the United States, it can be created while producing some other chemicals. Hexachloroethane can be formed if products that contain chlorinated hydrocarbons are burned.

How can it enter and leave your body?

Hexachloroethane can enter your body through the lungs when you breathe contaminated air. It can also be absorbed through your skin if you come into contact with the substance. Hexachloroethane can also enter your body if you drink contaminated water.

How can you be exposed to hexachloroethane?

You can be exposed to hexachloroethane if you work at military bases that use smoke pots or grenades during training. If you work near a hazardous waste site where hexachloroethane is disposed, you could breathe contaminated air. You could also be exposed by drinking contaminated water or touching contaminated soil. But you are less likely to be exposed to hexachloroethane by eating food. When it is released to soils, it will evaporate (turn into a vapor) into the air. This is also true when it is released in lakes or streams. You could be exposed if your workplace makes or uses hexachloroethane.

What are the health effects of exposure to hexachloroethane?

People who worked at a munitions factory that were exposed to low levels of hexachloroethane experienced mild skin irritation. Other than this example, very little information is available about health effects on humans. But animal studies show that exposure to hexachloroethane can irritate or bother your nose and lungs and cause mucus to build up in your nose similar to allergy symptoms.

Breathing high doses of hexachloroethane vapor can cause your face muscles to twitch and make it difficult to move. The animals in the study were exposed to greater levels of hexachloroethane than levels found near a hazardous waste site.

Although hexachloroethane is not very toxic, your liver could be affected if you are exposed to it for a long period of time. There is also a slim chance that exposure could cause some damage to the kidneys. The animal studies don't indicate that exposure to hexachloroethane could cause birth defects or affect your ability to have offspring.

Mice and male rats that were fed hexachloroethane during their lifetime developed liver tumors. The tumors found in the mice and male rats are not found in humans so it is not likely that hexachloroethane could cause you to develop cancer of the kidney. However, the Department of Health and Human Services

believes hexachloroethane may be a cancer causing substance.

What levels of exposure can result in harmful health effects?

The Occupational Safety and Health Administration has established a limit to ensure that workers are exposed to no more than 1 part per million (ppm) of hexachloroethane during an 8-hour work day for a 40-hour work week. In addition, the U.S. Environmental Protection Agency suggests that no more than 1 part per billion (ppb) of hexachloroethane be consumed over your lifetime.

Where can you get more information?

Contact your state health or environmental department, or:

Agency for Toxic Substances and Disease Registry
Division of Toxicology
1600 Clifton Road, N.E., E-29
Atlanta, Georgia 30333

References

1. Agency for Toxic Substances and Disease Registry (ATSDR). *Toxicological Profile for Hexachloroethane*. Atlanta, GA: U.S. Department of Health and Human Services, 1995.
2. U.S. Environmental Protection Agency. *Health Effects Notebook for Hazardous Air Pollutants, Hexachloroethane*. Office of Air Planning & Standards, 1994.

Hexachlorobutadiene

CAS Number: 87-68-3

What is hexachlorobutadiene?

Hexachlorobutadiene is a colorless liquid that smells like turpentine. It is formed when making other chemicals. This is called a by-product.

What is hexachlorobutadiene used for?

Most of the hexachlorobutadiene in the United States is imported from Germany. It has a number of uses. It is used to make rubber, it is used as a solvent and to make lubricants, in gyroscopes, as a heat transfer liquid, and as a hydraulic fluid.

How can hexachlorobutadiene enter and leave your body?

Hexachlorobutadiene can enter your body through breathing contaminated air, eating contaminated food, or drinking contaminated water. It can leave the body through urine.

How can you be exposed to hexachlorobutadiene?

You can be exposed to hexachlorobutadiene if you work in an industry that makes or uses hexachlorobutadiene. For example, a rubber manufacturer may use this chemical. If you work at a hazardous waste site where the chemical is disposed, you can breathe contaminated air. You can also be exposed to hexachlorobutadiene by eating contaminated food like fish or by drinking contaminated water.

What are the health effects of exposure to hexachlorobutadiene?

No studies have looked at the health effects of hexachlorobutadiene in humans. But animal studies show that mice that breathed large doses of hexachlorobutadiene for a short period of time experienced nose irritation.

None of the studies looked at the effects of breathing low doses of hexachlorobutadiene over a long period of time.

Rats and mice that drank low doses of hexachlorobutadiene over the short- and long-term showed kidney damage and liver damage.

Other studies show that rabbits exposed to hexachlorobutadiene through the skin for a short period of time showed kidney and liver damage.

The U.S. Environmental Protection Agency (EPA) believes hexachlorobutadiene can possibly cause cancer. One animal study showed that rats exposed to low doses of hexachlorobutadiene developed kidney tumors. However, it is not known if this exposure will cause cancer in humans.

What levels of exposure can result in harmful health effects?

No information available.

Where can you get more information?

Contact your state health or environmental department, or:

Agency for Toxic Substances and Disease Registry
Division of Toxicology
1600 Clifton Road, N.E., E-29
Atlanta, Georgia 30333

References

1. Agency for Toxic Substances and Disease Registry (ATSDR). *Toxicological Profile for Hexachlorobutadiene.* Atlanta, GA: U.S. Department of Health and Human Services, 1995.
2. U.S. Environmental Protection Agency. *Health Effects Notebook for Hazardous Air Pollutants, Hexachlorobutadiene.* Office of Air Planning & Standards, 1994.

Hexachlorocyclohexane, gamma

CAS Number: 58-89-9

What is hexachlorocyclohexane?

Hexachlorocyclohexane, gamma-, also known as HCH gamma- or lindane, is a white solid that turns into a vapor when released into the air. Once released, it looks colorless but has a musty odor. HCH gamma- is a man-made chemical and it exists in eight different forms.

What is hexachlorocyclohexane used for?

HCH gamma- was mostly used on fruit and vegetable crops to kill insects. Today it is used as an ingredient in ointments that help cure head lice, body lice, and scabies. HCH gamma- hasn't been made in the United States since 1977 but it is still brought into the country (imported) and formulated. The U.S. Environmental Protection Agency (EPA) has placed limits on what it can be used for in the United States. Only individuals who are certified can use it.

In your house, it is found in products like house sprays, shelf paper, and dog dips.

How can it enter and leave your body?

HCH gamma- can get into your body when you eat foods that contain the substance. When you breathe contaminated air, HCH gamma- can get into your lungs. When you use HCH gamma-containing products to remove lice and scabies, the substance can enter your body through your skin. Once in your body, the HCH gamma is stored for a short time in body fat. HCH gamma tends to leave the body very quickly through urine. Small amounts leave the body in feces and when you exhale (breathe out).

How can you be exposed to hexachlorocyclohexane?

There are several ways that you can be exposed to HCH gamma-. You can be exposed by eating HCH gamma- contaminated food like plants, meat or dairy products (milk). You could breathe contaminated air if your workplace makes or uses HCH gamma-. It is possible to be exposed by drinking HCH contaminated water or by breathing HCH released from waste sites or landfills. You could be exposed through skin contact if you use soaps, lotions or shampoo containing HCH gamma- that help treat and control head and body lice and scabies. Nursing mothers that have been exposed to HCH gamma- can pass it onto their babies in breast milk.

HCH gamma- has been found in soil and surface water at hazardous waste sites.

What are the health effects of exposure to hexachlorocyclohexane?

Workers exposed to HCH gamma- while making pesticides showed signs of lung irritation, heart disorders, blood disorders, headache, convulsions, and changes in sex hormones. Humans and animals exposed to large amounts of HCH gamma- died.

Reports show that some people who swallowed high doses of HCH gamma- had seizures and some died. Others exposed to very large doses developed blood disorders and had seizures. People who breathed HCH gamma- in the workplace developed blood disorders, experienced dizziness, headaches, and showed changes in the levels of sex hormones.

When animals were fed high doses of HCH gamma-, they had convulsions and went into a coma. Animals exposed to moderate or average doses showed kidney and liver problems (effects) and were also less able to fight off infections.

The Department of Health and Human Services has determined that HCH gamma- may very well be a carcinogen (cancer causing substance). Rats exposed to HCH gamma- showed evidence of liver cancer.

What levels of exposure can result in harmful health effects?

The harmful effects on humans and animals of breathing HCH gamma- over a short period of time (14 days or less) and over a long period of time (more than 14 days) aren't known.

Studies show that food containing the smallest doses of 0.3 parts per million (ppm) of HCH gamma- eaten over a short-term could be harmful to people. Food containing 0.02 ppm of HCH gamma- eaten over 2 - 32 weeks also posed risk. The effects of short- and long-term exposure from drinking water are not known.

Animal studies show that rats exposed to doses between 300 and 1,200 ppm of HCH gamma for 1 - 6 days showed learning problems and experienced seizures.

Rats exposed to 10 - 800 ppm of HCH gamma for 4 - 39 weeks showed increased ovary weight, learning problems, increased kidney weight, kidney damage, decreased red blood cells, coma, and injury to ovaries. Rabbits showed problems with the immune systems ability to fight off infections.

No information on the short- and long-term effects of drinking HCH gamma- are known.

Where can you get more information?

Contact your state health or environmental department, or:

Agency for Toxic Substances and Disease Registry
Division of Toxicology
1600 Clifton Road, N.E., E-29
Atlanta, Georgia 30333

References

1. Agency for Toxic Substances and Disease Registry (ATSDR). *Public Health Statement for Hexachlorocyclohexane.* Atlanta, GA: U.S. Department of Health and Human Services, 1989.
2. Agency for Toxic Substances and Disease Registry (ATSDR). *Toxicological Profile for Hexachlorocyclohexane.* Atlanta, GA: U.S. Department of Health and Human Services, 1995.
3. Reigart, Routt J. and Roberts, James R. Medical University of South Carolina. *Recognition and Management of Pesticide Poisonings.* Fifth ed. Washington, D.C.: U.S. Environmental Protection Agency, Office of Pesticide Programs, 1999.

Lead

CAS Number: 7439-92-1

What is lead?

Lead is a metal that looks bluish gray in color. It is found in the earth's crust in small amounts. It doesn't really have an odor or a taste. Most of the lead that we see today comes from human activities.

What is lead used for?

Lead is mostly used to make batteries. It is also used to make ammunition (bullets) and pipes, and roofing materials. It was used in the past to make paint and gasoline.

How can lead enter and leave your body?

Lead can get into your body when you breathe lead contaminated air. Once in your lungs, the lead gets into your blood and travels to other parts of your body and is stored up in your bones. When children swallow lead contaminated soil or paint chips, a lot more of the lead spreads into other body parts. Lead is less likely to enter your body through the skin. If you are exposed to lead for a long period of time, the older you get, the higher the levels of lead will be in your bones and teeth. The lead that is not stored in your bones will leave your body through urine and feces.

How can you be exposed to lead?

You can be exposed to lead by breathing contaminated air, eating contaminated food or soil and drinking water. Dust particles that have lead attached to them can be in the air. You can also breathe lead dust.

You can be exposed if you work at a hazardous waste site where lead is disposed. Some small children can be exposed if they eat paint chips containing lead or if the toys and other objects they put in their mouth have been exposed to lead dust or dirt.

Exposure to lead through skin contact does not happen very often. The most common exposure is from breathing lead. Because lead was used in gasoline at one time, traces of lead could be in the air from automobile fumes.

What are the health effects of exposure to lead?

Unborn children are at greatest risk from exposure to lead because their bodies are still being formed. Young children are also at risk. Young children exposed to lead can experience a number of problems including a decrease in intelligence, slowed growth and hearing problems.

Pregnant women, who are exposed to lead, can expose their unborn child to lead. The lead exposure can reduce the baby's birth weight, cause premature or early birth, and can even cause the child to be aborted.

Adults and children exposed to large amounts of lead can experience brain and kidney damage.

Middle-aged men have experienced an increase in blood pressure. It can damage male sperm and other reproductive systems.

It really is not known if lead can cause cancer in humans but rats and mice given large doses of lead developed tumors.

The United States Department of Health and Human Services has determined that certain forms of lead, like lead acetate and lead phosphate are anticipated carcinogens (cancer-causing substances).

What levels of exposure can result in harmful health effects?

The levels of lead in your blood are measured in micrograms per deciliter (ug/dL). Exposure to 100 - 150 ug/dL of lead for less than 14 days caused death in children and brain and kidney damage in adults. Pregnant women exposed to lead levels of 10 - 15 ug/dL can reduce the birth weight of infants and decrease their mental ability.

Exposure to 10 - 15 ug/dL of lead for more than 14 days reduced the birth weight of infants and decreased their mental ability. Exposure to 15 - 20 ug/dL decreased growth in young children. Exposure to 15 - 30 ug/dL increased blood pressure in middle-aged men, and exposure to 100 - 150 ug/dL of lead for less than 14 days caused death in children, and brain and kidney damage in adults.

Where can you get more information?

Contact your state health or environmental department, or:

Agency for Toxic Substances and Disease Registry
Division of Toxicology
1600 Clifton Road, N.E., E-29
Atlanta, Georgia 30333

References

1. Agency for Toxic Substances and Disease Registry (ATSDR). *Public Health Statement for Lead.* Atlanta, GA: U.S. Department of Health and Human Services, 1990.
2. Agency for Toxic Substances and Disease Registry (ATSDR). *Toxicological Profile for Lead.* Atlanta, GA: U.S. Department of Health and Human Services, 1993.
3. New York State Department of Health. Lead Exposure in Adults - A Guide for Health Care Providers. January 2001. Http://www.health.state.ny.us/nysdoh/lead/hlthcare.htm

Mercury

CAS Number: 7439-97-6

What is mercury?

Mercury is a metal that is found naturally in the environment. It can exist in several forms, as elemental mercury, and organic and inorganic mercury. Metallic mercury looks silver-white in color and is an odorless liquid. When it is heated, it becomes a colorless and odorless gas. Mercury can combine with other chemicals, for example, chlorine, carbon or oxygen, to form mercury compounds. The inorganic mercury compounds look like white powders or crystals. Mercuric chloride is an example of an inorganic mercury compound. Methylmercury is an example of an organic mercury compound.

Methylmercury is one of the most common forms of mercury that is known for its ability to build up in fish. As a result, very low levels of mercury can contaminate fish in oceans and lakes.

What is mercury used for?

Mercury is found in a number of commonly used commercial and household products like thermometers, thermostats, barometers, batteries, flourescent lights and lamps. Small traces of mercury are also used in dental amalgams used for teeth fillings. Mercury is also used as a power source for the generation of electricity.

In the past, methylmercury was used as a fungicide to destroy and prevent the growth of fungus on grains and animal feed. However, mercury-containing fungicides have since been banned from use in the United States.

How can mercury enter and leave your body?

As a vapor, mercury can enter your body if you breathe it. Organic and inorganic forms of mercury can get into your body if you eat contaminated food like fish or drink contaminated water. All forms of mercury can be absorbed directly through the skin. Once inside your body, it could be several months before all of the mercury leaves. Mercury leaves the body through the urine and feces.

How can you be exposed to mercury?

You can be exposed to mercury by eating contaminated fish or shellfish. Methylmercury is likely to build up in the tissues of certain fish. If you eat large amounts of fish, especially tuna and swordfish, then you may be at greater risk of exposure.

It is possible to breathe contaminated air if your work place handles mercury. You can be exposed to mercury if you work in the medical, dental, and other health services, and in chemical, metal processing, electrical equipment, automotive, building, and other industries.

Mercury exposure can also occur from National Priority List (NPL) sites, also known as Superfund sites. You can be exposed to mercury in the environment resulting from water and air near spills and toxic waste sites contaminated with mercury. Mercury is found at higher-than-normal background levels at 175 of 1,177 NPL sites.

You can be exposed to mercury that exists in background levels naturally. Air contains 2.4 parts of mercury per trillion parts of air (ppt). However, in areas where industries like mercury mines and mercury refineries are located, mercury levels can be close to 1,800 ppt.

What are the health effects of exposure to mercury?

The health effects of mercury depend largely on the type or form of mercury you are exposed to and the exposure route. Some forms of mercury, for example, mercury salts found in food or water, are more harmful to the kidneys.

Exposure to all forms of mercury can affect the central nervous system. Methylmercury and metal vapors are more dangerous because they can reach the brain. If you experience memory problems, become irritable or shy, experience tremors or changes in vision or hearing, it may be a symptom of mercury exposure.

Long-term exposure to organic or inorganic mercury can cause permanent brain and kidney damage. It can also damage the fetus as it develops.

Short-term exposure to high levels of organic and inorganic mercury will have similar health effects as long-term exposure. However, you are more likely to have a full recovery after short-term exposure. Once you have been exposed to mercury, you can experience hallucinations and become delirious. Exposure to mercury by inhalation can cause chest pains, dyspnea (difficulty breathing), and coughing. If you have been exposed to mercury, by inhalation (breathing) or ingestion, you will have a metallic taste in your mouth. You will also experience nausea, vomiting and severe stomach pain.

Pregnant women exposed to high levels of methylmercury from eating contaminated fish can expose their developing fetuses to mercury. The fetus is particularly vulnerable to developmental problems from exposure to mercury. Blindness, mental retardation, deafness, ataxia (loss of muscular control and coordination) and cerebral palsy has been seen in infants born to women who consumed high levels of methylmercury.

Mercury has not been shown to cause cancer in humans. Human studies have not linked exposure to elemental mercury to cancer. In addition, no studies exist on the ability of methylmercury to cause cancer.

The U.S. Environmental Protection Agency believes methylmercury is a possible cancer-causing agent but elemental mercury is not classifiable as a cancer-causing substance.

What levels of exposure have resulted in harmful health effects?

Human studies show that individuals exposed to 0.13 parts per million (ppm) of metallic mercury in the air for three hours experienced shortness of breath, chest pains, coughing and became irritable. Long-term exposure to 0.0032 ppm of metallic mercury for 15 years caused shakiness in humans.

The human health effects from breathing organic mercury are not known.

The short- and long-term human health effects of eating and drinking inorganic mercury are not known. However, animal studies have been used as the basis for developing a minimal risk level (MRL) of 0.814 ppm for short-term (less than 14 days) exposure from water, and an MRL of 0.063 ppm for long-term (greater than 14 days) from food.

The human health effects of eating and drinking organic mercury in the short- and long-term are not known. However, an MRL of 0.00027 ppm for short-term exposure in water was developed based on animal studies.

Where can you get more information?

Contact your state health or environmental department or:

Agency for Toxic Substances and Disease Registry
Division of Toxicology
1600 Clifton Road, N.E., E-29
Atlanta, Georgia 30333

References

1. Agency for Toxic Substances and Disease Registry (ATSDR). *Public Health Statement*

for Mercury. Atlanta, GA: U.S. Department of Health and Human Services, 1990.

2. Agency for Toxic Substances and Disease Registry (ATSDR). *Toxicological Profile for Mercury.* Atlanta, GA: U.S. Department of Health and Human Services, 1999.
3. U.S. Environmental Protection Agency. *Health Effects Notebook for Hazardous Air Pollutants, Mercury and Compounds*. Office of Air Planning & Standards, 1994.
4. Reigart, Routt J. and Roberts, James R. Medical University of South Carolina. *Recognition and Management of Pesticide Poisonings.* Fifth ed. Washington, D.C.: U.S. Environmental Protection Agency, Office of Pesticide Programs, 1999.

Methoxychlor

CAS Number: 72-43-5

What is methoxychlor?

Methoxychlor is a man-made chemical that looks like a pale-yellow powder and has a fruity or musty odor.

What is methoxychlor used for?

Methoxychlor is used to kill insects such as flies, mosquitoes, cockroaches, chiggers and others. It is also used on food crops, as an insecticide on farm animals (livestock), animal feed, grain, home gardens and pets.

How can methoxychlor enter and leave your body?

Methoxychlor can enter your body when you breathe contaminated air or if you eat contaminated food. It can leave the body very quickly. You can also get it on your skin if you touch it. Once in your body, methoxychlor can change into other chemicals and be released from the body.

How can you be exposed to methoxychlor?

Sometimes low doses of methoxychlor are found in food from when it was applied to farm crops. If you work in a factory that makes methoxychlor you are more likely to breathe it in the air or get it on your skin. You could also be exposed by way of air, soil or water if you work on a farm that uses methoxychlor on farm crops or farm animals.

If you use gardening products or pet sprays that contain methoxychlor you could be exposed to above average levels.

Methoxychlor may be present in higher levels in air, water and soil near hazardous waste sites that dispose of the substance. If you work in or near these sites, your exposure could be greater.

What are the health effects of exposure to methoxychlor?

There isn't a lot of information on how methoxychlor can affect your health. Studies show that animals exposed to high doses of methoxychlor experienced tremors, convulsions and seizures. Really high doses of methoxychlor could cause some damage to your body's nervous system. Unless you are exposed to high doses, methoxychlor will leave the body so quickly that this type of damage is not likely to happen.

The International Agency for Research on Cancer has determined that there is not enough information or evidence to show that methoxychlor causes cancer.

What levels of exposure have resulted in harmful health effects?

The U.S. Environmental Protection Agency (EPA) has set a reference dose (RfD) for methoxychlor at 0.005 milligrams per day. The RfD is an estimate of the highest daily oral exposure humans can be exposed to without resulting in harmful effects. EPA believes that consuming this amount or less over a lifetime will not cause chronic or noncancer effects. EPA has also set a limit of 0.04 parts per million (ppm) of methoxychlor in water. Children should not drink water containing more than 0.05 ppm for more than one day. In addition, adults should not drink water containing more than 0.2 ppm for up to seven years. The Occupational Safety and Health Administration has established a work place exposure limit for methoxychlor at 15

milligrams per cubic meter (mg/m^3) for an 8-hour work day and 40-hour work week.

Where can you get more information?

Contact your state health or environmental department, or:

Agency for Toxic Substances and Disease Registry
Division of Toxicology
1600 Clifton Road N.E., E-29
Atlanta, Georgia 30333

References

1. Agency for Toxic Substances and Disease Registry (ATSDR). *Toxicological Profile for Methoxychlor.* Atlanta, GA: U.S. Department of Health and Human Services, 1995.
2. Reigart, Routt J. and Roberts, James R. Medical University of South Carolina. *Recognition and Management of Pesticide Poisonings.* Fifth ed. Washington, D.C.: U.S. Environmental Protection Agency, Office of Pesticide Programs, 1999.
3. U.S. Environmental Protection Agency. *Health Effects Notebook for Hazardous Air Pollutants, Methoxychlor.* Office of Air Planning & Standards, 1994.

Naphthalene

CAS Number: 91-20-3

What is naphthalene?

Found naturally in fossil fuels like coal and oil, naphthalene looks like a white solid. It is produced when these fuels are burned and when tobacco or wood is burned. It has a strong odor that smells like tar or mothballs.

What is naphthalene used for?

Naphthalene is used to make products like moth balls that repel and keep moths away. It is also used to make dyes, leather goods, and insecticide.

How can naphthalene enter and leave your body?

Naphthalene can enter your body when you breathe contaminated air or eat and drink contaminated food and water. Once inside your body, it can damage the body's red blood cells. It also changes into other chemicals and leaves your body through urine in just a matter of days.

How can you be exposed to naphthalene?

You can be exposed to naphthalene from breathing contaminated air if you work in an industry that produces naphthalene. Examples of these industries include coal tar production, wood preserving, tanning, ink and dye production or an industry that burns wood, coal or oil. You can also be exposed to naphthalene from cigarette smoke in your home or business. If you work in a business that uses moth repellants, you could also be exposed.

Although you can be exposed to naphthalene from eating or drinking contaminated food and water, these are not common sources of exposure. In fact, the amount of naphthalene found in food is not known. You can also be exposed if you touch clothes or blankets that have come into contact with naphthalene.

What are the health effects of exposure to naphthalene?

If you are exposed to large doses of naphthalene, your red blood cells could be damaged or destroyed. This condition is called hemolytic anemia. Children who eat mothballs made with naphthalene can damage their red blood cells. If you or a child show signs of being tired, decrease in or no appetite, and pale or yellow skin, these symptoms may indicate your exposure to naphthalene. Other symptoms of exposure include nausea, vomiting, diarrhea and blood in your urine. Eating or breathing naphthalene caused cataracts in some animals but it is not clear if it will have the same effect on humans. Cataracts can cloud your vision making it difficult to see.

The noses and lungs of mice exposed to naphthalene vapors for two years were inflamed and irritated.

Naphthalene is not considered a cancer-causing substance. While there aren't any studies on the effects of naphthalene on humans, naphthalene caused cancer in female mice but not the male mice. It did not cause cancer in male or female rats.

What levels of exposure can result in harmful health effects?

Animal studies showed that giving animals 2,300 parts per million (ppm) to 20,400 ppm of naphthalene in their food from 1 to 10 days (short-term) reduced the litters of pregnant female mice,

caused death in mice, increased the liver weight in rats and caused cataracts in rabbits.

Rats exposed to 9,000 ppm of naphthalene for 9 weeks (long-term) had a change in their liver enzyme activity.

Where can you get more information?

Contact your state health or environmental department, or:

Agency for Toxic Substances and Disease Registry
Division of Toxicology
1600 Clifton Road, N.E., E-29
Atlanta, Georgia 30333

References

1. Agency for Toxic Substances and Disease Registry (ATSDR). *Public Health Statement for Naphthalene.* Atlanta, GA: U.S. Department of Health and Human Services, 1990.
2. Agency for Toxic Substances and Disease Registry (ATSDR). *Toxicological Profile for Naphthalene.* Atlanta, GA: U.S. Department of Health and Human Services, 1996.
3. New Jersey Department of Health and Senior Services. *Hazardous Substance Fact Sheet: Naphthalene.* Trenton, NJ. Right To Know Program, 1998.
4. U.S. Environmental Protection Agency. *Health Effects Notebook for Hazardous Air Pollutants, Naphthalene,* Office of Air Planning & Standards, 1994.

Polycyclic Aromatic Hydrocarbons (PAHs)

What are PAHs?

Short for polycyclic aromatic hydrocarbons, PAHs describe chemicals that are often found together in groups of two or more. PAHs are found naturally in the environment but they can also be man-made. In their purest form, PAHs are solid and range in appearance from colorless to white or pale yellow-green. PAHs are created when products like coal, oil, gas, and garbage is burned but the burning process is not complete. Although PAHs can exist in over 100 different combinations, the most common are treated as a group of 15. They are:

1. acenaphthene
2. acenaphtylene
3. anthracene
4. benz(a)anthracene
5. benzo(a)pyrene
6. benzo(b)fluoranthene
7. benzo(ghi)perylene
8. benzo(k)fluoranthene
9. chrysene
10. dibenz(a,h)anthracene
11. fluoranthene
12. fluorene
13. indeno(1,2,3-cd)pyrene
14. phenanthrene
15. pyrene

What are PAHs used for?

Most of the PAHs are used to conduct research. However, some of the PAHs are used to make dyes, plastics and pesticides. Some are even used in medicines.

How can PAHs enter and leave your body?

One of the most common ways PAHs can enter the body is through breathing contaminated air. The PAHs get into your lungs when you breathe them. If you eat or drink food and water that are contaminated with PAHs, you could be exposed. Exposure to PAHs can also occur if your skin touches PAH contaminated soil or products like heavy oils, coal tar, roofing tar or creosote. Creosote is an oily liquid found in coal tar and is used to preserve wood. Once in your body, the PAHs can spread and target fat tissues. Target organs include kidneys, liver and fat. However, in just a matter of days, the PAHs will leave your body through urine and feces.

How can you be exposed to PAHs?

You can be exposed to PAHs in the environment, in your home and in the workplace. Because PAHs exist naturally in the environment, and they are man-made, you can be exposed in a number of ways. Fumes from vehicle exhaust, coal, coal tar, asphalt, wildfires, agricultural burning and hazardous waste sites are all sources of exposure.

You could be exposed to PAHs by breathing cigarette and tobacco smoke, eating foods grown in contaminated soil, or by eating meat or other food that you grilled. Grilling and charring food actually increases the amount of PAHs in the food.

If you work in a plant that makes coal tar, asphalt and aluminum, or that burns trash, you can be exposed to PAHs. You can also be exposed if you work in a facility that uses petroleum or coal, or where wood, corn and oil are burned.

What are the health effects of exposure to PAHs?

A number of PAHs have caused tumors in laboratory animals that were exposed to PAHs through their food, from breathing contaminated air, and when it was applied to their skin. When pregnant mice ate high doses of a PAH (benzo(a)pyrene) they experienced reproductive problems. In addition, the offspring of the pregnant mice showed birth defects and a decrease in their body weight. Other effects include damage

to skin, body fluids and the immune system which help the body fight disease. However, these effects have not been seen in humans.

What levels of exposure have resulted in harmful health effects?

There is no information available from studies on humans to tell what effects can result from being exposed to individual PAHs at certain levels. However, breathing PAHs and skin contact seem to be associated with cancer in humans. Animal studies showed that exposing mice to 308 parts per million (ppm) of PAHs (specifically benzo(a)pyrene) in food for 10 days (short-term exposure) caused birth defects. Mice exposed to 923 ppm of benzo (a) pyrene in food for months developed problems in the liver and blood.

Where can I get more information?

Contact your state health or environmental department, or:

Agency for Toxic Substances and Disease Registry
Division of Toxicology
1600 Clifton Road, N.E., E-29
Atlanta, Georgia 30333

References

1. Agency for Toxic Substances and Disease Registry (ATSDR). *Public Health Statement, Polycyclic Aromatic Hydrocarbons.* Atlanta, GA: U.S. Department of Health and Human Services, 1990.

Pendimethalin

CAS Number: 40487-42-1

What is pendimethalin?

Pendimethalin is a crystal-like solid that appears orange yellowish in color and has a fruity odor. It is a man-made chemical that is used primarily as a herbicide.

What is pendimethalin used for?

Pendimethalin is used primarily as a herbicide to destroy or prevent the growth of certain plants like weeds. It is also used on crops and residential lawns and ornamentals (plants that are grown for their beauty). It is used and applied in various forms including a liquid, solid, granular etc.

How can pendimethalin enter and leave your body?

Pendimethalin can enter your body if you breathe contaminated air or eat contaminated food. It can also be absorbed by your skin if you come into contact with the substance. Pendimethalin can leave your body through urine and feces.

How can you be exposed to pendimethalin?

You can be exposed to pendimethalin released to the air if you work in an industry where it is made or used. You can be exposed to pendimethalin through your diet. Traces of pendimethalin applied to crops can be digested. If you work in an industry that makes or uses pendimethalin, you can be exposed to the substance. If you work in an occupation where you are responsible for the application of the herbicide to crops or lawns, you are at greater risk of exposure. Homeowners who use pendimethalin for lawn care may also be at risk.

What are the health effects of exposure to pendimethalin?

Pendimethalin is considered of low acute toxicity. However, it has caused thyroid problems in male and female rats. Exposure to pendimethalin through diet is extremely low. So is the risk of cancer through this route. In addition, it has been classified as a possible cancer causing substance.

Although animal studies show that pendimethalin has a low toxicity, it is slightly toxic if you are exposed to it by eating or drinking contaminated food or water. It is also toxic if it gets in the eyes. Exposure is “practically” non-toxic if you breathe pendimethalin or if it is absorbed through the skin.

What levels of exposure have resulted in harmful health effects?

Animal studies show that short-term exposure of animals to > 5,000 milligrams per kilogram of pendimethalin resulted in the death of 50% of experimental animals. This number is called a lethal dose (LD_{50}).

Where can you get more information?

Contact your state health or environmental department, or:

Agency for Toxic Substances and Disease Registry
Division of Toxicology
1600 Clifton Road, N.E., E-29
Atlanta, Georgia 30333

References

1. U.S. Environmental Protection Agency. *R.E.D. FACTS, Pendimethalin.* Office of Prevention, Pesticides and Toxic Substances, 1997.
2. Extension Toxicology Network. *Pesticide Information Profile for Pendimethalin.* Cornell University, Ithaca, NY.

Pentachlorobenzene

CAS Number: 608-93-5

What is pentachlorobenzene?

Pentachlorobenzene is a substance that looks like white or colorless crystals and has an odor. Pentachlorobenzene is a man-made substance that is used to make another chemical, pentachloronitrobenzene. Therefore, pentachlorobenzene enters the environment when pentachloronitrobenzene is used.

What is pentachlorobenzene used for?

Pentachlorobenzene is used to make pentachloronitrobenzene, a fungicide. In addition, it has been and is currently used as a fire retardant.

How can pentachlorobenzene enter and leave your body?

Pentachlorobenzene can enter your body by eating or drinking contaminated food and water or by breathing contaminated air.

How can you be exposed to pentachlorobenzene?

You can be exposed to pentachlorobenzene if you work in a business or industry that makes the substance. Pentachlorobenzene can be released to the air during its production as well as during the application of pentachloronitrobenzene as a fungicide.

What are the health effects of exposure to pentachlorobenzene?

Short-term exposure to pentachlorobenzene can affect the central nervous system. Long-term exposure can affect the liver and kidneys and can cause tissue lesions. Animal studies and tests show that pentachlorobenzene can possibly cause toxic effects on human reproduction.

What levels of exposure have resulted in harmful health effects?

Animal studies show that exposure of rats to 1080 milligrams per kilogram (mg/kg) of pentachlorobenzene resulted in the death of 50% of experimental animals. This number is called a lethal dose (LD_{50}). The LD_{50} for mice exposed to pentachlorobenzene was 1175 mg/kg.

Where can you get more information?

Contact your state health or environmental department, or:

Agency for Toxic Substances and Disease Registry
Division of Toxicology
1600 Clifton Road, N.E., E-29
Atlanta, Georgia 30333

References

1. Great Lakes Initiative Bioaccumulative Chemicals of Concern (BCCs), http://www.webaxs.net/noel/lotlink/bccs.html
2. International Joint Commission. Pentachlorobenzene. http://www.ijc.org/boards/iaqab/meyer/pentachloro.htm
3. The National Toxicology Program (NTP). *Chemical Repository: Pentachlorobenzene.* Http://ntp-server.niehs.nih.gov/
4. World Health Organization (WHO)/ International Program on Chemical Safety & the Commission of the European Communities/ International Labour Organization.

International Chemical Safety Card: Pentachlorobenzene; 1995

5. U.S. Department of Health and Human Services. Hazardous Substances Data Bank (HSDB, online database). National Library of Medicine Bethesda, MD, 2001.

Pentachloronitrobenzene

CAS Number: 82-68-8

What is pentachloronitrobenzene?

Pentachloronitrobenzene is a substance that looks like cream-colored or colorless crystals and has a musty odor.

What is pentachloronitrobenzene used for?

Pentachloronitrobenzene is used to prevent the formation of slime in industrial waters. It is also registered as a fungicide that helps prevent or destroy the growth of fungus. It is primarily used to prevent the growth of fungi on grass, lawn flowers, ornamental crops, shrubs and in gardens. It has agricultural uses to protect cotton and grain seeds like barley, oats, rice and wheat from the growth of fungi.

How can pentachloronitrobenzene enter and leave your body?

Pentachloronitrobenzene can enter your body through breathing contaminated air, eating or drinking contaminated food or water and by skin contact.

How can you be exposed to pentachloronitrobenzene?

You can be exposed to pentachloronitrobenzene by eating contaminated food. Pentachloro-nitrobenzene typically builds up in the fatty tissues of animals. This means that eating beef, pork, poultry, fish as well as dairy products can be a source of exposure.

If you work in a business that makes or uses pentachloronitrobenzene you can be exposed if you breathe contaminated air or if your skin comes into contact with the substance.

What are the health effects exposure to pentachloronitrobenzene?

The effects of long-term exposure of pentachloronitrobenzene on humans are not known. However, animal studies show that dogs exposed to pentachloronitrobenzene through diet experienced liver damage. Rats exposed to high levels of pentachloronitrobenzene show an enlarged liver and an increase in the weight of the liver.

What levels of exposure have resulted in harmful health effects?

No information or studies exist on whether pentachloronitrobenzene can cause cancer in humans. However, the U.S. Environmental Protection Agency (EPA) has classified it as a possible cancer causing substance because of the harmful effects seen in mice. For example, mice orally exposed to pentachloronitrobenzene experienced hepatomas, a cancerous tumor in the liver. In addition, skin tumors developed in rats after their skin was exposed to pentachloronitrobenzene.

The EPA has said that a reference does of 0.003 milligrams per kilogram a day of pentachloronitrobenzene will not cause cancerous effects.

Where can you get more information?

Contact your state health or environmental department, or:

Agency for Toxic Substances and Disease Registry

Division of Toxicology
1600 Clifton Road, N.E., E-29
Atlanta, Georgia 30333

References

1. U.S. Environmental Protection Agency. *Health Effects Notebook for Hazardous Air Pollutants, Quintozene (Pentachloronitrobenzene).* Office of Air Planning & Standards, 1994. U.S.
2. California Air Resources Board. Toxic Air *Contaminant Fact Sheets: Pentachloronitrobenzene.* Toxic Air Contaminant Identification List Summaries - ARB/SSD/SES, 1997.
3. Reigart, Routt J. and Roberts, James R. Medical University of South Carolina. *Recognition and Management of Pesticide Poisonings.* Fifth ed. Washington, D.C.: U.S. Environmental Protection Agency, Office of Pesticide Programs, 1999.

Pentachlorophenol

CAS Number: 87-86-5

What is pentachlorophenol?

In its purest form, pentachlorophenol is a colorless crystal. It is a man-made chemical that is not found naturally in the environment. When it is really hot, it has a sharp chemical smell but at room temperature there is just a very faint odor.

What is pentachlorophenol used for?

Pentachlorophenol was used as a biocide to kill small organisms and is now used as a wood preservative to protect wood from decay and insect attack. Although pentachlorophenol was widely used as a pesticide, its use has been restricted so that only people with special certification or a licence can purchase and use it.

It is not commercially available for use in your home; however, it is still used as a wood preservative to protect power line poles, cross arms, and fence posts from decay and insect attack.

How can pentachlorophenol enter and leave your body?

If you breathe contaminated air, pentachlorophenol can get into your lungs. You can also be exposed by eating or drinking contaminated food or water. Pentachlorophenol can also enter your body through skin contact and can leave your body through urine.

How can you be exposed to pentachlorophenol?

The greatest exposure to pentachlorophenol comes from inhaling contaminated air. If you work in a lumber mill or a business that does wood treatment, you could be exposed to pentachlorophenol contaminated air. You could breathe contaminated air if you are near a waste site where it is disposed or it can get into your skin if you touch contaminated soil. Drinking contaminated water near a waste site, accidental spill or work site is another source of exposure. You could also eat contaminated food such as fish. However, keep in mind that exposure to pentachlorophenol by eating and drinking contaminated food and water is not very common.

What are the health effects of exposure to pentachlorophenol?

If you are exposed to large doses of pentachlorophenol over a short period of time, or small doses over a long period, your liver, kidneys, blood, lungs, nervous system, immune system and gastrointestinal tract could be damaged. If you come into direct contact with pentachlorophenol it could bother your skin, eyes, and mouth. This is especially true if pentachlorophenol is in the form of a hot vapor.

Animal studies show that the number of offspring born to animals exposed to pentachlorophenol during pregnancy decreased. It is unknown if exposure will cause birth defects in humans.

Based on animal studies that show increased risk of cancer to the livers and adrenal glands of mice, the International Agency for Research on Cancer believes pentachlorophenol could possibly cause cancer. But strong evidence that can link it to causing cancer in humans doesn't exist.

What levels of exposure can result in harmful health effects?

If you eat or drink about 50 - 500 milligrams per kilograms of pentachlorophenol, it is considered a

lethal dose. Breathing pentachlorophenol over a short period of time can also cause death because of heart failure and changes in your body's circulatory system.

Where can you get more information?

Contact your state health or environmental department, or:

Agency for Toxic Substances and Disease Registry
Division of Toxicology
1600 Clifton Road, N.E., E-29
Atlanta, Georgia 30333

References

1. Agency for Toxic Substances and Disease Registry (ATSDR). *Toxicological Profile, Pentachlorophenol.* Atlanta, GA: U.S. Department of Health and Human Services, 1995.

Phenanthrene

CAS Number: 85-01-8

What is phenanthrene?

Phenanthrene is one of a group of chemicals called polycyclic aromatic hydrocarbons, PAHs for short. PAHs are often found together in groups of two or more. They can exist in over 100 different combinations but the most common are treated as a group of 15. PAHs are found naturally in the environment but they can also be man-made. Phenanthrene is a colorless, crystal-like solid but can also look yellow. PAHs are created when products like coal, oil, gas, and garbage is burned but the burning process is not complete.

Very little information is available on the individual chemicals within the PAH group. Most of the information available is for the PAH group as a whole. Information specific to phenanthrene is included in this fact sheet when available.

What is phenanthrene used for?

Most of the PAHs are used to conduct research. Like most PAHs, phenanthrene is used to make dyes, plastics and pesticides, explosives and drugs. It has also been used to make bile acids, cholesterol and steroids.

How can phenanthrene enter and leave your body?

One of the most common ways phenanthrene can enter your body is through breathing contaminated air. It can get into your lungs when you breathe it. If you work in a hazardous waste site where PAHs are disposed, you are likely to breathe phenanthrene and other PAHs. If you eat or drink food and water that are contaminated with PAHs, you could be exposed.

Exposure can also occur if your skin comes into contact with contaminated soil or products like heavy oils, coal tar, roofing tar or creosote where PAHs have been found. Creosote is an oily liquid found in coal tar and is used to preserve wood. Once in your body, the PAHs can spread and target fat tissues. Target organs include kidneys, liver and fat. However, in just a matter of days, the PAHs will leave your body through urine and feces.

How can you be exposed to phenanthrene?

You can be exposed to most PAHs in the environment, in your home and in the workplace. Because PAHs exist naturally in the environment, and they are man-made, you can be exposed in a number of ways. Fumes from vehicle exhaust, coal, coal tar, asphalt, wildfires, agricultural burning and hazardous waste sites are all sources of exposure.

You could be exposed to PAHs by breathing cigarette and tobacco smoke, eating foods grown in contaminated soil or by eating meat or other food that you grilled. Grilling and charring food actually increases the amount of PAHs in the food. If you work in a plant that makes coal tar, asphalt and aluminum, or that burns trash, you can be exposed to PAHs. You can also be exposed if you work in a facility that uses petroleum or coal or where wood, corn and oil are burned.

What are the health effects of exposure to phenanthrene?

A number of PAHs have caused tumors in laboratory animals that were exposed to PAHs through their food, from breathing contaminated air and when it was applied to their skin. When pregnant mice ate high doses of a PAH

(benzo(a)pyrene), they experienced reproductive problems. In addition, the offspring of the pregnant mice showed birth defects and a decrease in their body weight. Other effects include damage to skin, body fluids and the immune system which help the body fight disease. However, these effects have not been seen in humans.

What levels of exposure have resulted in harmful health effects?

There is no information available from studies on humans to tell what effects can result from being exposed to individual PAHs at certain levels. However, breathing PAHs and skin contact seem to be associated with cancer in humans. Animal studies showed that exposing mice to 308 parts per million (ppm) of PAHs (specifically benzo (a) pyrene) in food for 10 days (short term exposure) caused birth defects. Mice exposed to 923 ppm of benzo (a) pyrene in food for months developed problems in the liver and blood.

The U.S. Environmental Protection Agency has indicated that not enough information exists to classify phenanthrene as a cancer causing substance.

Where can I get more information?

Contact your state health or environmental department, or:

Agency for Toxic Substances and Disease Registry
Division of Toxicology
1600 Clifton Road, N.E., E-29
Atlanta, Georgia 30333

References

1. Agency for Toxic Substances and Disease Registry (ATSDR). *Public Health Statement, Polycyclic Aromatic Hydrocarbons.* Atlanta, GA: U.S. Department of Health and Human Services, 1990.
2. Faust, Rosmarie A., Oak Ridge National Laboratory, Chemical Hazard Evaluation Group. *Toxicity Summary for Phenanthrene.* Oak Ridge, TN:1993.

Pyrene

CAS Number: 129-00-0

What is pyrene?

Pyrene is one of a group of chemicals called polycyclic aromatic hydrocarbons, PAHs for short. PAHs are often found together in groups of two or more. They can exist in over 100 different combinations but the most common are treated as a group of 15. PAHs are found naturally in the environment but they can also be man-made. Pyrene is colorless crystal-like solid but can also look yellow. PAHs are created when products like coal, oil, gas, and garbage is burned but the burning process is not complete.

Very little information is available on the individual chemicals within the PAH group. Most of the information available is for the PAH group as a whole. Information specific to pyrene is included in this fact sheet when available.

What is pyrene used for?

Most of the PAHs are used to conduct research. Like most PAHs, pyrene is used to make dyes, plastics and pesticides. It has also been used to make another PAH called benzo(a)pyrene.

How can pyrene enter and leave your body?

One of the most common ways pyrene can enter your body is through breathing contaminated air. It can get into your lungs when you breathe it. If you work in a hazardous waste site where PAHs are disposed, you are likely to breathe pyrene and other PAHs. If you eat or drink food and water that are contaminated with PAHs, you could be exposed.

Exposure can also occur if your skin comes into contact with contaminated soil or products like heavy oils, coal tar, roofing tar or creosote where PAHs have been found. Creosote is an oily liquid found in coal tar and is used to preserve wood. Once in your body, the PAHs can spread and target fat tissues. Target organs include kidneys, liver and fat. However, in just a matter of days, the PAHs will leave your body through urine and feces.

How can you be exposed to pyrene?

You can be exposed to most PAHs in the environment, in your home and in the workplace. Because PAHs exist naturally in the environment, and they are man-made, you can be exposed in a number of ways.

If you smoke cigarettes you can be exposed to pyrene since it has been found in tobacco and cigarette smoke. Exposure to other PAHs can occur by eating foods grown in contaminated soil or by eating meat or other food that you grilled. Grilling and charring food actually increases the amount of PAHs in the food. You could be exposed to pyrene by eating smoked fish or meats. It has also been found in surface water and drinking water.

Pyrene has been detected in coal tar so if you work at a business that makes or uses coal tar you could be exposed to pyrene and other PAHs.

What are the health effects of exposure to pyrene?

Animal studies showed that mice that were fed pyrene developed nephropathy, a kidney disease. A decrease in the weight of the kidney and an increase in the weight of the liver was also seen. In addition, there were some slight changes in the blood.

A number of PAHs have caused tumors in laboratory animals that were exposed to PAHs through their food, from breathing contaminated air and when it was applied to their skin. When pregnant mice ate high doses of a PAH (benzo(a)pyrene) they experienced reproductive problems. In addition, the offspring of the pregnant mice showed birth defects and a decrease in their body weight. Other effects include damage to skin, body fluids and the immune system which help the body fight disease. However, these effects have not been seen in humans.

What levels of exposure have resulted in harmful health effects?

There is no information available from studies on humans to tell what effects can result from being exposed to individual PAHs at certain levels. However, breathing PAHs and skin contact seem to be associated with cancer in humans. Animal studies showed that exposing mice to 308 parts per million (ppm) of PAHs (specifically benzo (a) pyrene) in food for 10 days (short term exposure) caused birth defects. Mice exposed to 923 ppm of benzo (a) pyrene in food for months developed problems in the liver and blood.

The U.S. Environmental Protection Agency EPA has indicated that not enough information exists to classify pyrene as a cancer causing substance.

Where can I get more information?

Contact your state health or environmental department, or:

Agency for Toxic Substances and Disease Registry
Division of Toxicology
1600 Clifton Road, N.E., E-29
Atlanta, Georgia 30333

References

1. Agency for Toxic Substances and Disease Registry (ATSDR). *Public Health Statement, Polycyclic Aromatic Hydrocarbons.* Atlanta, GA: U.S. Department of Health and Human Services, 1990.
2. Faust, Rosmarie A., Oak Ridge National Laboratory, Chemical Hazard Evaluation Group. *Toxicity Summary for Pyrene.* Oak Ridge, TN:1993.

Trifluralin

CAS Number: 1582-09-8

What is trifluralin?

Trifluralin is a man-made chemical that looks like a yellowish-orange solid or crystal.

What is trifluralin used for?

Trifluralin is used primarily as a herbicide on grass, to control broadleaf weeds and on some crops (fruits and vegetables), flowers and shrubs. Cotton and soybeans are examples of some crops it is used on.

How can trifluralin enter and leave your body?

Trifluralin can enter and leave your body when you breathe contaminated air or absorbed by the skin if you come in contact with the substance. It can also enter your body if you eat trifluralin-contaminated food.

How can you be exposed to trifluralin?

You can be exposed to trifluralin if you breathe contaminated air or touch lawns or crops that have been treated with trifluralin. Exposure can occur if you eat fish that have been exposed to trifluralin contaminated water. Another source of exposure is through your work place. If you work in a business where trifluralin is being made, you could be exposed if trifluralin is released to the air while it is being produced. In addition, if you are responsible for applying the herbicide you can also be exposed. Farm workers who come in contact with treated crops are also at risk of exposure. Lastly, trifluralin could be released to water from agricultural runoff.

What are the health effects of exposure to trifluralin?

There is very little information available on the short- and long-term effects on humans from exposure to trifluralin. However, animal studies show that trifluralin is moderately toxic to rats, mice and rabbits who were exposed to trifluralin for a short period. These animals were exposed to trifluralin by inhalation (breathing), ingestion (eating/drinking food or water) or skin contact.

Dogs exposed to trifluralin for long periods of time showed weight loss, changes in blood and an increase in their liver weight.

The offspring of mice that were fed trifluralin, showed abnormalities in the skeleton. The fetuses of pregnant mice and rats that were fed trifluralin experienced a decrease in their weight.

Rats who were fed trifluralin developed tumors in their urinary tract and in the thyroid. In addition, the U.S. Environmental Protection Agency (EPA) has determined that trifluralin could possibly cause cancer in humans.

What levels of exposure have resulted in harmful health effects?

EPA has indicated that exposure to 0.0075 milligrams per kilogram per day of trifluralin or less over a lifetime would not result in noncancer effects.

Where can you get more information?

Contact your state health or environmental department, or:

Agency for Toxic Substances and Disease Registry
Division of Toxicology
1600 Clifton Road, N.E., E-29
Atlanta, Georgia 30333

References

1. Reigart, Routt J. and Roberts, James R. Medical University of South Carolina. *Recognition and Management of Pesticide Poisonings.* Fifth ed. Washington, D.C.: U.S. Environmental Protection Agency, Office of Pesticide Programs, 1999.
2. U.S. Environmental Protection Agency. *R.E.D. FACTS, Trifluralin.* Office of Prevention, Pesticides and Toxic Substances, 1996.
3. U.S. Environmental Protection Agency, *Health Effects Notebook, for Hazardous Air Pollutants, Trifluralin.* Office of Air Quality Planning & Standards, 1994.